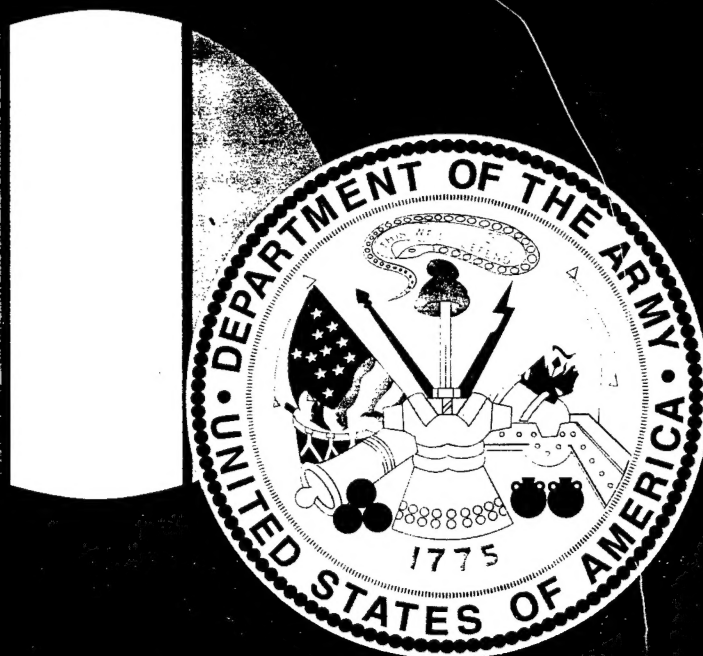


# **BATTLE LABS**



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***Maintaining the Edge***



*Operation Desert Storm was a "Janus" war . . . the beginning of future warfare and some of the old.*

**General Frederick M. Franks, Jr.**

# REPORT DOCUMENTATION PAGE

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Commanding General  
United States Army Training and Doctrine Command  
Fort Monroe, Virginia

This brochure is about ***Battle Labs***—why the program exists, what it has done, and its campaign plan for the future. The brochure is the companion to ***Louisiana Maneuvers...The First Year***, published by the Louisiana Maneuvers Task Force in March 1994. They are guides for senior leaders in Government, the Armed Forces, Industry, and Academia to understand how the Army is “***changing the way it changes***” and include the early results and insights we have generated from this process.



The very title, ***Battle Labs...Maintaining the Edge***, provides evidence of this dynamic process. We established Battle Labs in 1992 to experiment with changing methods of warfare, beginning where we saw battle changing. Our aim then and now is to ensure future generations of soldiers and leaders have the same battlefield edge we had on Desert Storm and other recent operations. To do that, we cannot stand still and we have not. What we have done in the Army and TRADOC is adopt a revolutionary method to change—forming hypotheses of changing methods of operation, then conducting experiments using soldiers and leaders in increasingly realistic live, tactically competitive training environments. From these experiments we develop warfighting requirements for the Force Projection Army to maintain our edge in war and operations other than war. It is a method at once unique for land warfare, yet also with similarities to methodologies being rapidly adopted in the commercial sector.

Yet, Battle Labs involve more than improvements in weapons technology in either single platforms or technology inserted horizontally across the combined arms team. From this process teamed with LAM, our Army is simultaneously changing doctrine, training, leader development, organizations and soldier systems. While this was never a static exercise in the past, it is even more dynamic today given the variety in the scope and scale of current and anticipated Army missions, the “speed of the competition,” and the opportunities of Information Age technology.

Battle Labs then are an institutionalized shelter within which we can rapidly develop requirements for a Force Projection Army through experimentation that encourages innovation and multi-disciplined participation. We listen to soldiers conducting our experiments because of their tactical savvy gained from recent operational experience and because they are the generation of soldiers and leaders who will execute the answers. Battle Labs also allow users and developers to team, providing each other continuous feedback and permitting frequent and rapid “tuning” of requirements. Our early work has focused on going beyond the beginnings of change we saw in Operations Just Cause and Desert Storm by seeking to exploit Information Age technology. We know, for example, that combat power follows information flow and we are experimenting to cause that to happen. Thus, Battle Labs experiment as we operate—as a team that emphasizes horizontal integration of new capabilities and changing existing paradigms of combat, combat support, and combat service support relationships.

The soldiers and civilians of Battle Labs are “pathfinders” for the Army of the 21st Century. I am enthusiastic about what we have been able to do as a team with our partners across the Army. This brochure helps document that teamwork and the important work they have done and will do in the coming years.

Frederick M. Franks, Jr.  
General, U.S. Army  
Commanding General



# How you think about the *future*...

Pundits often accuse armies of preparing to fight as if their next war will be a "replay" of the last war they fought. However, no matter how successful any army is in combat, vulnerabilities and deficiencies will always be identified that must be corrected. Of course, when an army is not successful, the need to develop capabilities that would have prevented failure is even more dramatic. Regardless of the imperative, when an army, or any organization, focuses exclusively on its last operation or activity, the army will probably not be ready to meet future demands. This is because, *how* you think about the future, frames *what* you think about the future, which drives what you *do* about the future.

Pundits cannot accuse the United States Army of preparing to fight its next war as if it was a replay of the last "war" it fought, mainly because the Army participated in so many operations and operations other than war in the recent past. The Army participated in 47 major deployments since 1990. Thanks to Information Age technology, many of them have left indelible images on the collective American memory. The sheer number and types of Army operations and operations other than war in the last few years reflect the dramatic nature of change throughout the world and the need for a highly versatile Army. Moreover, recent operational experience produced some glimmerings of future warfare and reinforced the importance of building capabilities to meet anticipated or future requirements instead of those of the last major conflict.

Today, *how* the United States Army thinks about the future reflects an appreciation of the dramatic changes that have occurred and are occurring throughout the world and in American society. The end of the Cold War, the surge of irredentist activity around the world, the enhanced role of the United Nations in countering aggression and meeting humanitarian needs, the availability of relatively inexpensive high-technology equipment to anyone who wishes to buy it, and the advent of the Information Age have had significant impact on the Army.

Instead of a well-defined and fixed threat, we are today confronted with ill-defined threats and multiple potential adversaries, all with the ability to obtain very sophisticated technologies (lasers, global positioning systems, tactical ballistic missiles, air defense missiles, advanced optics,



and weapons of mass destruction) and use them against us, even in small quantities, at home and abroad, to achieve tremendous battlefield leverage. The implications of this phenomenon, or the "speed of the competition," is that the Army must change how we think about the future. Thus, we must have an institutionalized means to experiment with new warfighting ideas, techniques and technologies to quickly adjust and enhance battlefield capabilities for war and operations other than war. We needed a means to maintain the edge unique to the set of strategic, policy, threat, and resource circumstances we are in. Thus, the invention of Battle Labs.

**Battle Labs...**

## Recent Operations and Operations other than War...

- › Urgent Fury
- › Just Cause
- › Desert Shield
- › Desert Storm
- › Restore Hope
- › Provide Comfort
- › Hurricanes Andrew & Iniki
- › Mid-West Floods
- › Able Sentry

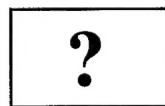


## Speed of the Competition *A Paradigm Shift...*



### *Cold War*

- › Fixed, defined threat
- › Easy to predict
- › Focused S&T intelligence
- › Turn inside Soviet cycle



### *Current*

- › Ambiguous threat(s)
- › Hard to predict
- › High-payoff technologies widely available
- › Turn inside whose cycle?

- › Global Positioning Systems
- › Optics
- › Weapons of Mass Destruction
- › Cellular Phones
- › Lasers
- › Tactical Ballistic Missiles

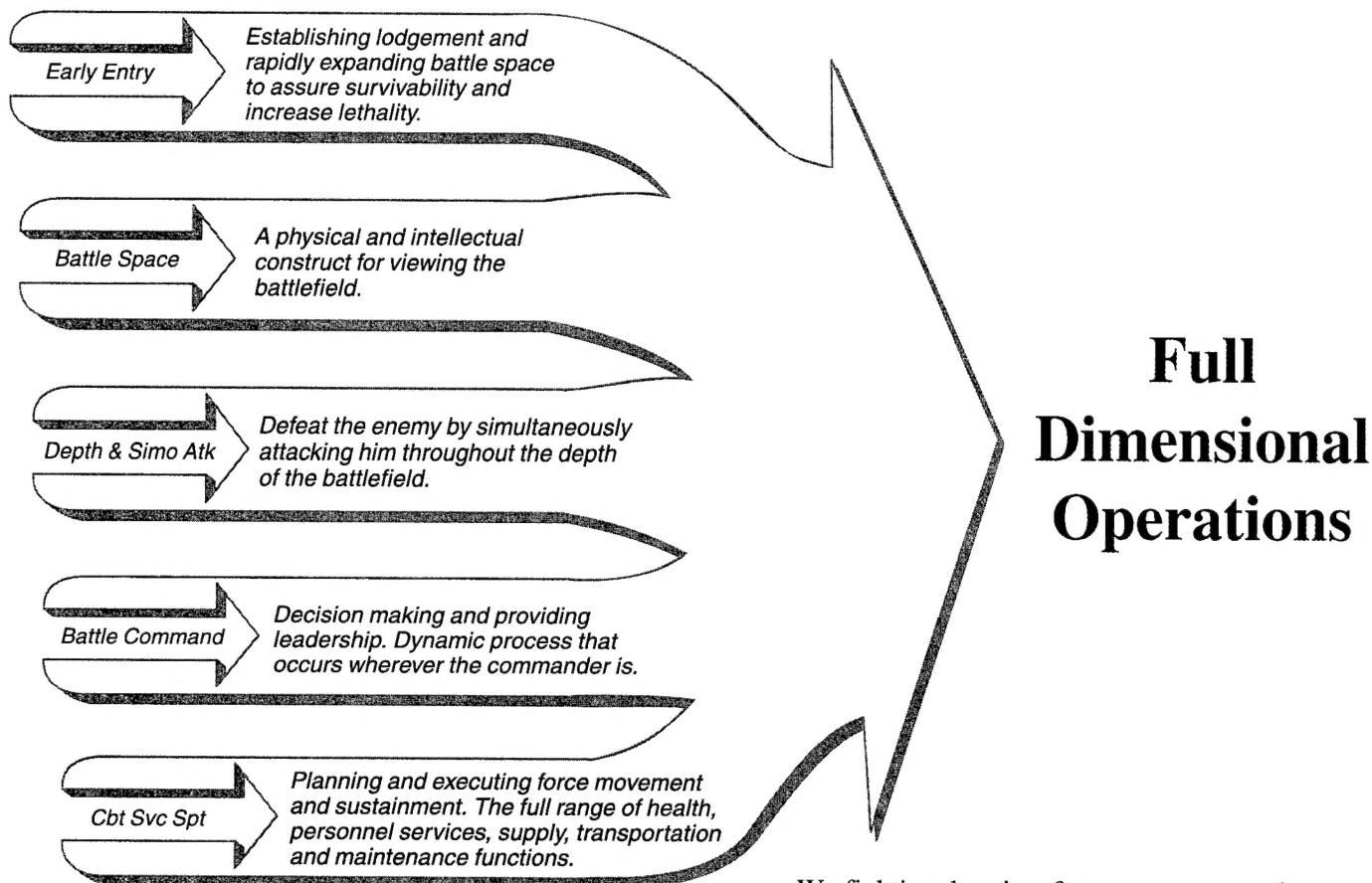


*The world is changing rapidly... if you do not make change your friend, then it can become your enemy.*

President Bill Clinton  
West Point, June 1993

# What you think about the *future*... —

## Battlefield Dynamics



Warfighting doctrine, future concepts, and modernization objectives reflect *what* an army thinks about its role in the future. The United States Army's principal warfighting doctrine, Field Manual (FM) 100-5, Operations, the TRADOC Pamphlet (Pam) 525-5 (Draft), Future Full-Dimensional Operations, and the Army Modernization Objectives reflect an appreciation of the changing nature of the battlefield and operations other than war.

The *battlefield dynamics* codify the aspects of warfighting or military operations that appear to have the greatest potential for change. They were our shorthand code to inform us about where to begin experimentation or the "what" we think about the future. It is in the battlefield dynamics that we expect the majority of requirements for the Force Projection Army. The battlefield dynamics describe the need to: increase lethality and survivability of early entry forces; expand and dominate dismounted and mounted battle space; attack an adversary simultaneously in all dimensions

## Army Modernization Objectives

- *Project and Sustain the Force*
- *Protect the Force*
- *Win the Information War*
- *Conduct Precision Strikes*
- *Dominate the Maneuver Battle*



throughout the depth of the battlefield while protecting our forces; command and move information throughout the force in near-real time while on the move; and, use and reuse scarce assets to sustain the force in war and operations other than war.

The June 1993 edition of *FM 100-5, Operations*, introduces the concept of “Full-Dimensional Operations,” with Army units operating as elements of Joint and Combined task forces in force projection operations around the world. This replaces the “AirLand Battle” doctrine of earlier editions of FM 100-5, which focused primarily on “pure” Army units fighting the Warsaw Pact on the plains of Europe. The new FM 100-5 also documents that Army units will participate in various types of operations other than war—peace enforcement, anti terrorism, peacekeeping, counter drug, disaster relief and nation building to name just a few.

*TRADOC Pamphlet 525-5 (Draft), Future Full-Dimensional Operations*, is a means for

TRADOC to explore future warfighting ideas and concepts. It provides the conceptual underpinnings for Battle Lab experiments. TRADOC Pam 525-5 (Draft) describes a revolutionary approach to command made possible by anticipated advances in information technology and breaking existing paradigms that define relationships between combat, combat support, and combat service support. The concept explores how to achieve force coherence through information — a common relevant picture of the battlefield — versus traditional physical means. Unlike previous 525-5s, this version is a “living document” designed for continuous refinement ultimately leading to development of the next FM 100-5. More conceptual than its predecessors, TRADOC Pam 525-5 (Draft) provides focus, stimulates thought and generates discussion of future operations during this period of rapid technological advance and great strategic uncertainty.

### *The Army Modernization Objectives—*

Project and Sustain the Force, Protect the Force, Win the Information War, Conduct Precision Strikes, and Dominate the Maneuver Battle—established by Chief of Staff of the Army, General Gordon R. Sullivan, serve to focus the modernization efforts of the Army. This is especially important given the Army’s reduced research and development budget. As with FM 100-5, they reflect a dramatic change in what the Army thinks about the nature of future operations.

The 1994 edition of the *Army Science and Technology Master Plan* provides even sharper focus for those involved with building tomorrow’s Army. It matches research and development activities to the Army Modernization Objectives and detailed capability requirements. Moreover, it documents the importance of rapid development of operational capabilities given the “speed of the competition” and rapid evolution of technology.

*In the past, we have looked to other armies for inspiration, innovation and growth...the world has changed. Today everyone goes to school on the U.S. Army...*

**General Gordon R. Sullivan**  
Chief of Staff

# What you **DO** about the future...

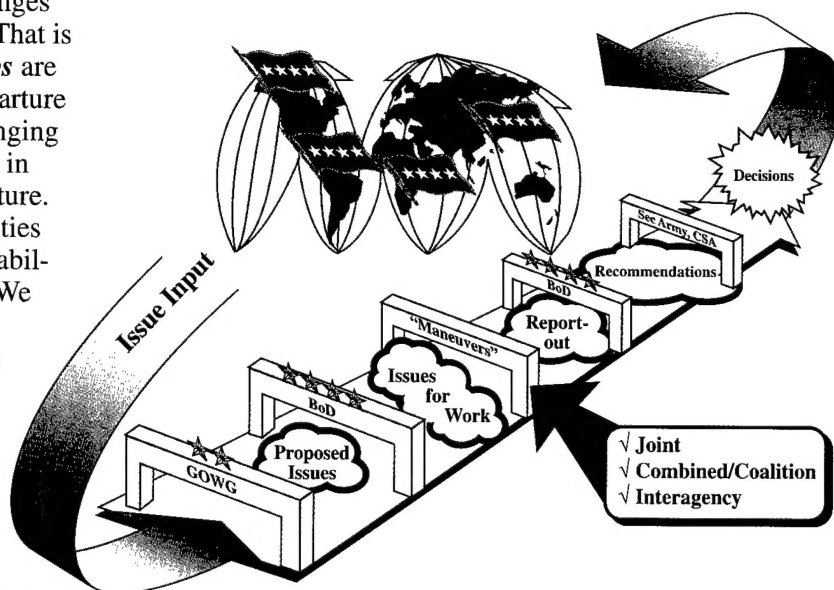
The Army is “changing the way it changes” in order to *do* something about the future. That is what *Louisiana Maneuvers* and *Battle Labs* are all about. Each represents a significant departure from a “business as usual” approach to changing the Army. Both reflect the dramatic change in how and what the Army thinks about the future. As we adapt to the Nation’s emerging priorities and grow smaller, we must increase the capability and sustain the readiness of our forces. We must think in terms of rapidly fielding new technology, new organizations, and changes to tactics, techniques and procedures.

In the early 1940s, General George C. Marshall used a series of exercises in Louisiana to prepare the Army for victory in World War II. Today, we use the intellectual underpinnings of those exercises to focus and prepare America’s Army to serve the Nation. We borrow from the spirit of change that General Marshall created by adopting the name: *Louisiana Maneuvers*.

Louisiana Maneuvers (LAM) in the 1990s allow the Army to energize and focus the forces of change while simultaneously keeping the Army strong, trained, and ready. LAM balances the challenges of today with the requirement to think about and grow the Army into the 21st Century. It provides a structured forum for the senior leadership to ask the right questions and identify the most important issues. From the beginning LAM was to be the institutional shelter within which the Army could examine needed changes in processes to execute its Title 10 responsibilities, and to maintain the edge in fighting and winning as part of a joint team or in operations other than war.

The Louisiana Maneuvers process begins with issue nominations from the field. A General Officer Working Group (GOWG), made up of two-star representatives from the Army’s reserve components, major commands, and the Army Staff, then brainstorms the issues submitted. Of the hundreds of Title 10 and warfighting issues considered, only the most important are passed to the Louisiana Maneuvers Board of Directors (the Army’s four-star generals) for deliberations.

The Board of Directors (BoD) considers the issue, approves some of them for study, and individual board members take proponentcy of issues to work them in their commands. As proponents,



individual board members supervise the study and evaluation of assigned issues through exercises such as Ulchi Focus Lens in Korea, Fuertes Defensas in Central America, REFORGER in Europe, Prairie Warrior at Fort Leavenworth, Kansas, and the General Headquarters Exercise Army-wide. They also use existing simulations and resources such as the Battle and Research Laboratories to examine, explore, observe, and learn. Army Staff sponsors, who provide information on studies and projects related to the issue, assist issue proponents during the course of investigation. Further, sponsors suggest programmatic savings and tradeoffs for each option brought to the Board of Directors.

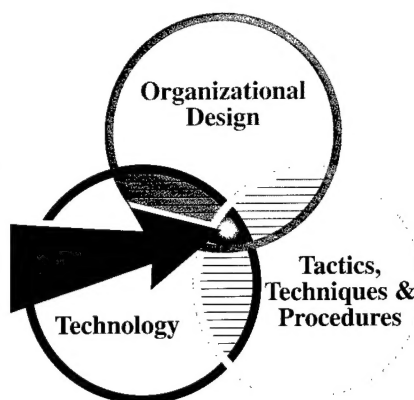
After investigation, issue proponents report back to the four-star BoD with decision packages containing observations, lessons learned, and options. The BoD then offers its own advice and recommendations to the Chief of Staff and Secretary of the Army for decisions on funding and priority. This streamlined process provides the Army’s senior leadership strategic agility in decision making by building consensus around the most viable options and allows important decisions to be made in a matter of months instead of years. The process also ensures a more confident look at resources and expenditures as prioritization and funding decisions are made on capabilities needed to execute the National Military Strategy.



Experimenting with ideas, concepts, and technology...

...horizontally integrated across the entire force...

...to maximize our battlefield advantage in lethality, survivability and tempo of operations



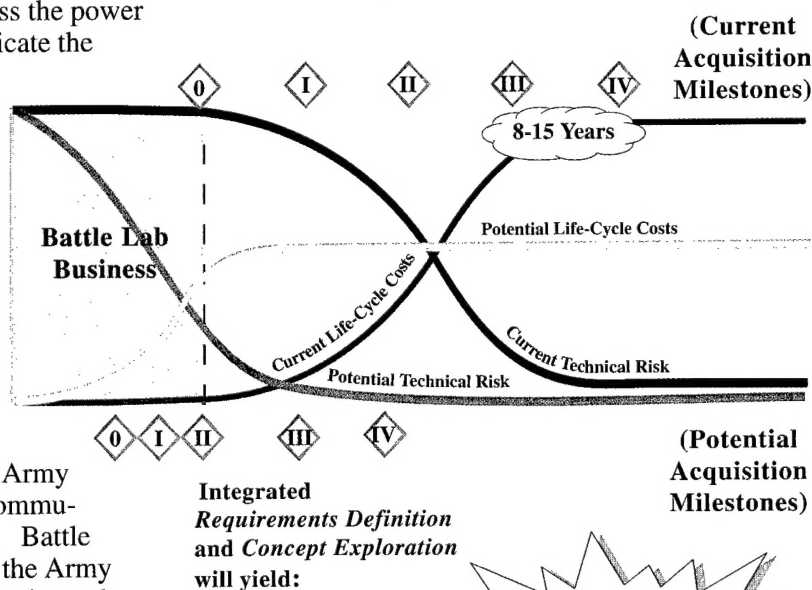
**Battle Labs** are a United States Army Training and Doctrine Command (TRADOC) innovation to experiment with changing methods of warfare beginning with the battlefield dynamics and with soldiers and leaders as the center of focus. Publicly announced in April 1992, the name is meant to convey the image of soldiers experimenting with *warfighting concepts* in order to generate *battlefield insights*. The program began in May 1992 to focus the doctrine, training, leader development, organization design, materiel, and soldier systems efforts of TRADOC on the battlefield dynamics. It immediately adopted an experimental approach and sought to harness the power of simulation technology able to replicate the battlefield with increasing fidelity. Experiments began almost immediately and began to have operational payoff.

This approach represented a radical departure from the traditional Army and TRADOC approach to generating warfighting requirements, which was largely "paper" based and lacked meaningful *experiential* data. While Battle Labs started as a means to focus internal TRADOC activity, the Army Materiel Command and the testing community are now partners in the program. Battle Labs have generated changes in how the Army conducts other activities, to include horizontal technology integration, technology insertion, materiel acquisition, and operational testing and evaluation.

Battle Labs conduct holistic appraisals of critical operational capability requirements needed

to meet the changing nature of warfighting captured in the battlefield dynamics. The appraisals are holistic in that they examine the needs of the entire combined arms and services team in a wide variety of relevant current and future scenarios. This in turn facilitates horizontally integrated *requirements definition* conducted concurrently with *concept development* which dramatically streamlines the entire process of fielding new capabilities across the entire doctrine, training, leader development, organization design, materiel and soldier system spectrum.

Aggregate materiel fielding data generated the current life-cycle costs and technical risk lines portrayed on the chart below. Fielding data of new doctrine, training and leader development programs, organizations, and soldier systems could generate comparable "life-cycle" and "technical risk" lines. The potential life-cycle costs and technical risk lines do not have "hard" data to support them – yet – but all indications are that the tremendous synergistic effects generated by bringing the entire Army combat and materiel development communities into an integrated requirements definition and concept exploration process will yield at least as much "compression" as that portrayed.



- Lower Costs
- Reduced Technical Risk
- Quicker Fielding

# Battle Labs Scope and Scale...

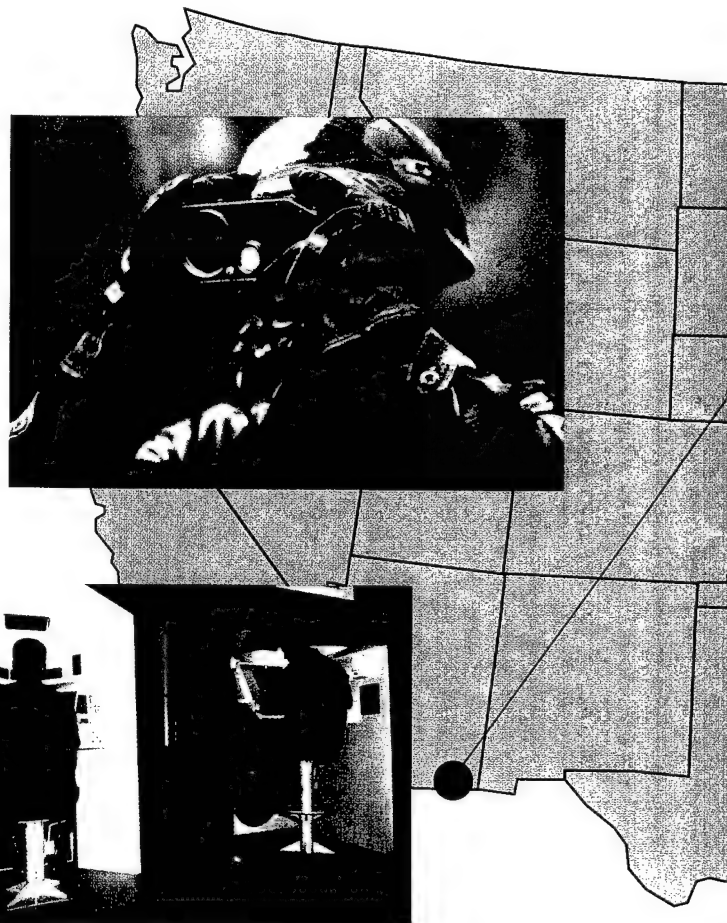
There are six battle labs. Each addresses one of the battlefield dynamics. The battlefield dynamics are the categories of military activity where there appears to be the greatest potential for change from current concepts and capabilities, and simultaneously, the areas where new requirements are emerging.

Each Battle Lab has a general officer director chartered by the TRADOC Commanding General. While all of the directors have additional responsibilities, Battle Lab Director is their principal duty. Together with the TRADOC Active Component Deputy Commanding Generals, and the Commanding General of the Marine Corps Combat Development Command (MCCDC), they constitute a "board of directors" for the overall Battle Labs program. The "chairman of the board" is the TRADOC Commanding General.

The board of directors obtains advice and counsel from an Army Science Board Study Group. Distinguished leaders from Industry and Academia form the group. Most have served in the upper echelons of government and the military. They conduct periodic visits to the Battle Labs where they serve as "murder boards" for ongoing experiments and "sounding boards" for proposed experiments.

Battle Lab staffs mirror the combined arms and services teams affected by changes in the battlefield dynamics. Each Battle Lab has a small permanent staff. Each staff is a multi-discipline mix of commissioned officers, warrant officers, noncommissioned officers, soldiers and civilians from a variety of branches and specialties, to include operations research and systems analysis (ORSA), the Army Acquisition Corps, and space operations. Most of the Battle Labs personnel have advanced military schooling and postgraduate degrees, to include several officers and civilians with "hard science" PhDs. The Army Materiel Command (AMC) has also assigned representatives from several Research, Development, and Engineering Centers (RDECs) as permanent members of each of the labs. Additionally, the other Services and many Allied armies have assigned liaison officers to the Battle Labs.

Because of the holistic and horizontal nature of Battle Lab experimentation, Battle Labs draw on expertise from across the Army and the other Services. Since the change represented by each battlefield dynamic affects all branches, every

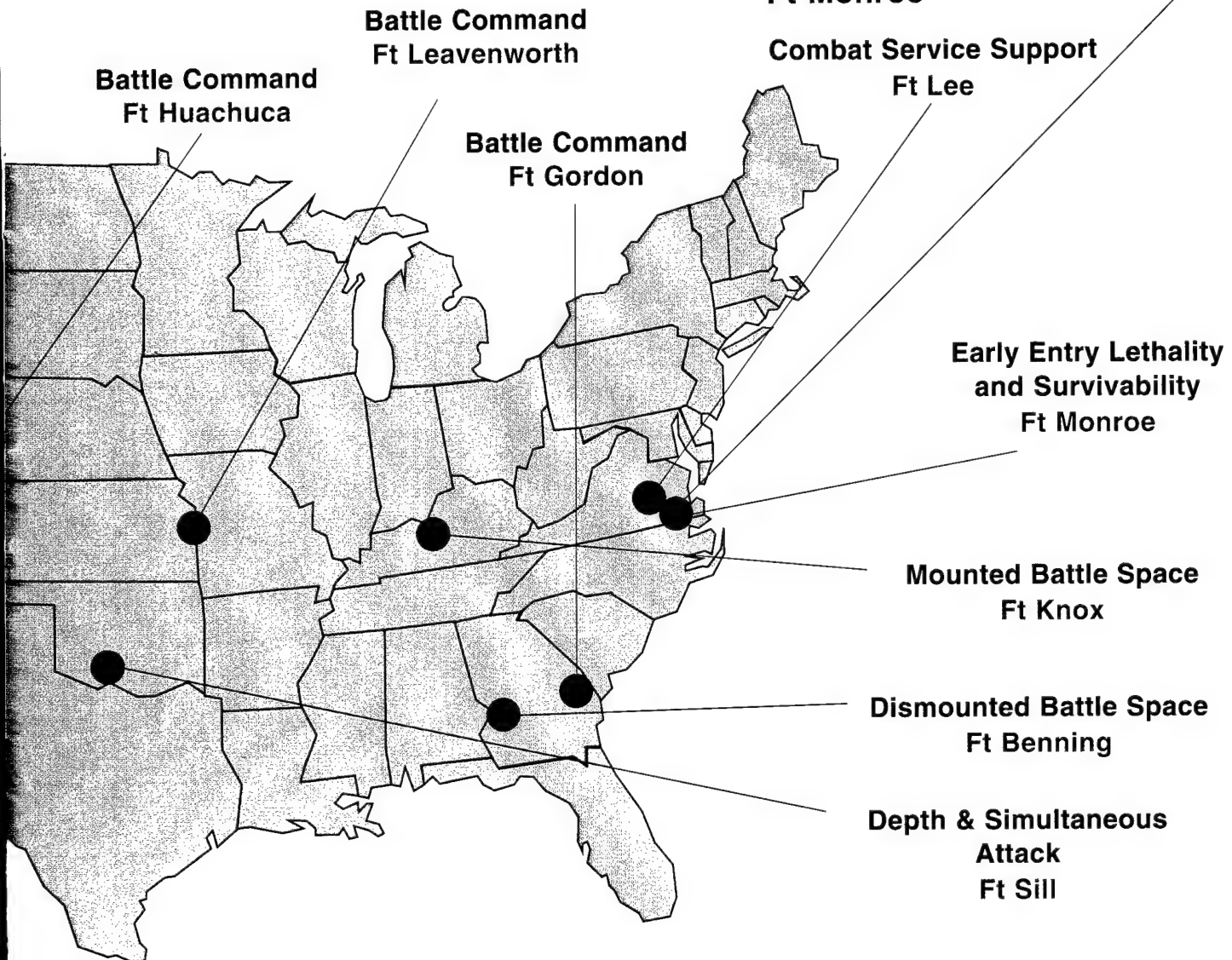


TRADOC school and center work with all of the Battle Labs. The TRADOC Analysis Command supports all Battle Lab experiments. Within TRADOC, the Battle Lab directors are empowered with tasking authority to ensure appropriate people and organizations work together to experiment with warfighting concepts and define requirements. Individual Battle Labs work on relatively small numbers (five to seven) of high-payoff initiatives at a time. Because they are "laboratories" in the truest sense of the word, Battle Labs experiment with a wide variety of "hypotheses," called warfighting concepts. A high "failure" or concept rejection rate is not only accepted but expected.

Six of the eight Battle Lab locations are also home to U.S. Army Forces Command



## Battle Lab Integration & Technology Directorate Ft Monroe



(FORSCOM) units, and have ready access to test and range facilities. As with the Army Materiel Command, FORSCOM is an active participant in the Battle Labs program.

All of the Battle Labs are acquiring robust constructive and virtual simulations capabilities. These capabilities will allow them to conduct independent experimentation or, when linked by the TRADOC Simulation Internet, participate in larger, multi-faceted experiments.

Battle Labs are one of the first Army organizations to use an internetted, not hierarchical, organization. Battle Labs leaders encourage all members of the "team" to conduct direct coordination and share good ideas. They are linked to each other and

outside organizations by various means. All Battle Labs personnel have electronic mail addresses in the ARMY.MIL network, which is accessible by most electronic mail systems. Additionally, each Battle Lab is in the AMC Research and Development Information Management System (RIMS) developed for the Missile Command. RIMS provides the means to share data on ongoing experiments, access large libraries of data, transfer graphics and other files, and provides Industry with a "bulletin board" describing current Battle Lab activities and operational capability requirements. Most of the Battle Labs also have a toll-free telephone number (provided at the back of this document).

# Battle Command Battle Lab

The Battle Command Battle Lab has elements at three locations. The element at Fort Leavenworth, Kansas, provides overall direction for the lab and works on issues concerning the "art" or concepts and principles of command. The element at Fort Gordon, Georgia, works on issues concerning the technical means of command. The element at Fort Huachuca, Arizona, works on issues concerning intelligence collection and dissemination and electronic warfare. Together, the three elements are responsible for integrating all TRADOC activity related to the art and science of battle command and information warfare.

Defining requirements to enable commanders to operate anywhere on the battlefield and while on the move is the lab focus. This represents a vast change from earlier Army "command and control" initiatives. During the Cold War, command and control came to be regarded as a hierarchical network of semi-fixed command posts stretching from "the Fulda to the Rhine rivers." Recent operations and operations other than war demonstrated that commanders and key staffs cannot afford to be "prisoners" in command posts, and must be able to operate on the move throughout the battle space. Moreover, rigidly hierarchical information flow is incompatible with modern dynamic operations. Commanders need internettted information systems with easily accessible data bases to command forces on modern battlefields.

Battle Command Battle Lab issues and initiatives start with work on the art of Battle Command – how commanders lead and decide, how information impacts on decision making and how information flows in high performing organizations. Work on the means of collecting, processing, disseminating, and protecting that information follows. Key actions ongoing include:

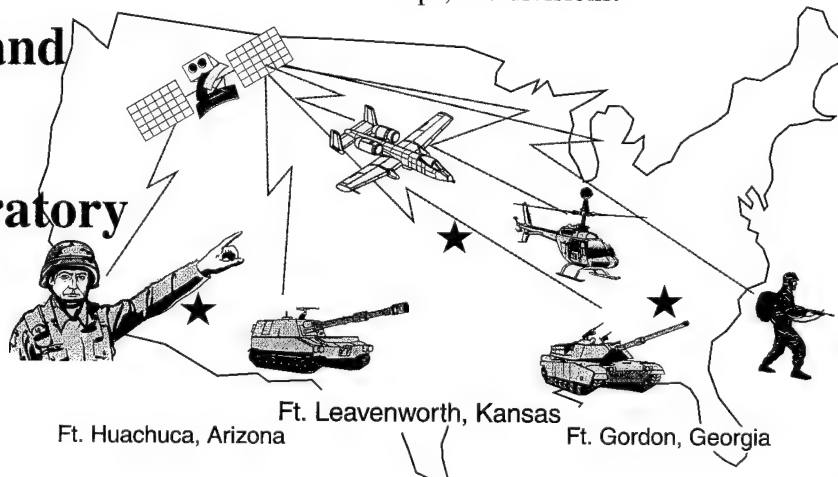
the 1994 Louisiana Maneuvers issue, a "Holistic Review of C4I;" development of the new battle command vehicle; experiments focusing on the impact of information on decision makers

and their staffs; development of a decision support system for battle commanders; a joint warfighting interoperability experiment; design for an Integrated Battlefield Targeting Architecture; focusing intelligence information on the tactical decision maker, and many others.

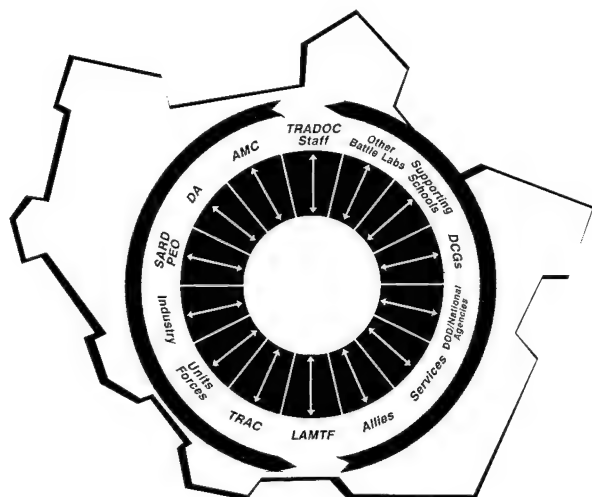
The Battle Command Battle Lab was responsible for the development and accelerated fielding of the 1993 Louisiana Maneuvers issue "Commercial Space Package." The Army's Program Objective Memorandum included the Commercial Space Package. The package includes commercially available "off-the-shelf" space technologies to support deploying Joint Task Forces, Army corps, and divisions.



**B**attle  
**C**ommand  
**B**attle  
**L**aboratory



# Combat Service Support Battle Lab



One of the greatest lessons learned from the Gulf War was the need for better logistics to support a Force Projection Army. Future threats will not allow a gradual buildup of logistics resources. Modern warfare no longer supports the Cold War paradigm of static logbases and vast warehouses of prepositioned stocks in a well developed theater. For these reasons, HQ TRADOC chartered the Combat Service Support Battle Lab at Fort Lee, Virginia. The organization is responsible for providing direction, oversight, and horizontal integration for the Combat Service Support battlefield dynamic area. To make force projection logistics a reality, the CSS Battle Lab is focused on Total Distribution, which includes Total Asset Visibility and Seamless Logistics.

Total Asset Visibility is the ability to quickly ascertain the whereabouts and quantity of all classes of supply. To accomplish this, the CSS Battle Lab is experimenting with processes such as Split Operations, Central Distribution Activity, Modularity, and Intransit Visibility. The CSS Battle Lab is also experimenting with hardware such as Automatic Identification Technology (AIT) and Palletized Loading System (PLS) enhancements. To tie it all together, the lab is conducting a Total Distribution Advanced Technology Demonstration to further define "situational awareness for the logistician" and provide senior leaders "single point visibility" of the entire logistics system.

To achieve Seamless Logistics, the CSS Battle Lab is improving management information

systems and incorporating unobtrusive tactical automation that will decrease the amount of manual input to logistics systems. One example is the Soldier Readiness Card, which will help automate personnel transactions while reducing data redundancy.



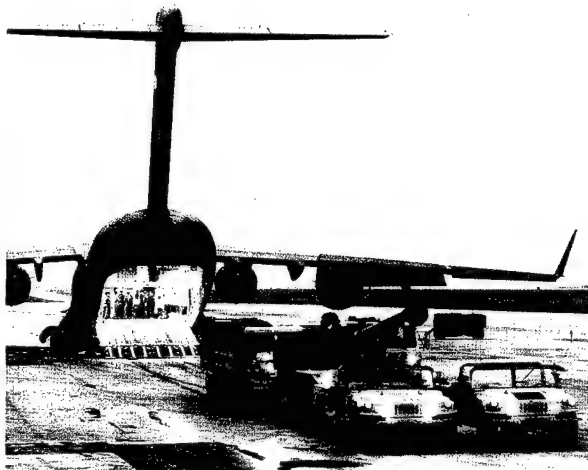
Seamless logistics is only possible with the combined efforts of many organizations. The CSS Battle Lab works closely with the Defense Logistics Agency, United States Transportation Command, Air Mobility Command, and the Military Sealift Command. The CSS Battle Lab also integrates the efforts of the Transportation School, the Quartermaster School, the Ordnance School, and the other Battle Labs to ensure horizontal integration of issues across the entire CSS battlefield dynamic.

One of the CSS Battle Lab's recent successes is Force Provider, a modular test and refit facility. Forces Command received the first module in November, 1993.



# Early Entry Lethality... and Survivability Battle Lab

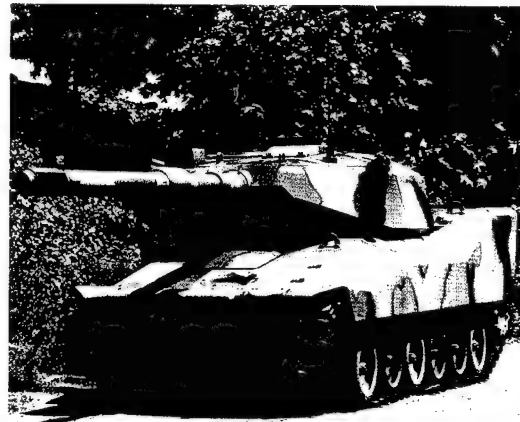
Photograph courtesy of McDonnell Douglas



The Early Entry Lethality and Survivability Battle Lab is colocated with Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia. The battle lab charter is to: optimize the lethality of early entry forces; improve deployability with significantly less lift than required today; optimize the Intelligence Preparation of the Battlefield (IPB) for the contingency theater; optimize force mix configurations for early entry deployment to improve mobility, survivability, and sustainability of early entry forces; optimize organizational structures to facilitate planning, preparation, and execution of early entry operations; and capitalize on unique capabilities of the other Services and Special Operations Forces (SOF) to enhance lethality and survivability of early entry forces.

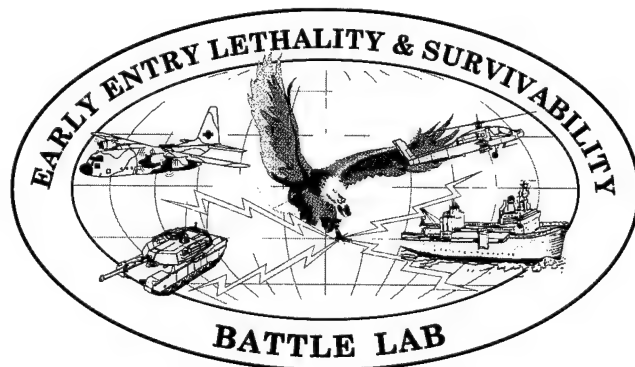
The battle lab interacts with numerous field commands, Joint commands, Service agencies, Defense research and development laboratories and industrial representatives to address its chartered tasks and actually provide enhanced capabilities for early entry forces.

The battle lab has strong ties with airborne forces and the operational test activity at Fort Bragg, NC. Early experiments at Fort Bragg included experiments with precision high altitude air delivery systems and interfacing "off-the-shelf"



data processing and communications equipment with recently acquired XVIIIth Airborne Corps enroute communications. The objective of the latter is to provide a robust, "seamless," Early Entry Battle Command capability. The battle lab also works with armored units from Fort Stewart, Georgia and Fort Hood, Texas.

The Early Entry Lethality and Survivability Battle Lab experiments with several early entry force packages for warfighting and operations other than war. Ongoing initiatives include: 2,000 (2K) and 10,000 (10K) soldier early entry force studies; "Middleweight" force mix studies; "Lightening the Armored Force" studies; early entry countermine experiments; prepositioning equipment afloat decision tools; and Logistics Over The Shore (LOTS) operations in support of Joint Task Forces (JTFs).



# Depth and Simultaneous Attack Battle Lab



The Depth and Simultaneous Attack Battle Lab is at Fort Sill, Oklahoma. It is responsible for integrating all TRADOC activity related to conducting simultaneous attacks in all three dimensions against an enemy throughout the depth of the battlefield. The lab foci are: defining requirements to detect and identify enemy forces throughout the depth of the battlefield; conveying that information in near real-time from the sensors to engagement systems; and, conducting unilateral and joint precision strikes to defeat them.

The concept of simultaneous attack in depth is more than a continuation of the Cold War "Follow-on Forces Attack (FOFA)" initiative. Limited sensor and weapons systems technologies, along with the huge size of the Warsaw Pact, made FOFA a concept to "nibble" at second and later echelons. FOFA would slow them down and steer them towards areas where the main battle forces would defeat them. The

depth and simultaneous attack battlefield dynamic envisions defeating enemy forces throughout the battle space whenever and wherever detected. Its essence is to stun and then rapidly defeat or disarm an opposing force with overwhelming combat power.

Since this concept is inherently "joint" in nature...sensors, shooters, and command elements...the Depth and Simultaneous Attack Battle Lab works closely with the other Services. An example of this is Operation Crossbolt in which the battle lab is orchestrating Army Field Artillery, Air Defense Artillery, and Aviation center participation with Air Combat Command units working to perfect Joint Precision Strikes.

A related initiative being worked by the battle lab is the Department of Defense Advanced Concept and Technology Demonstration for Precision Strike. Other important issues being worked by the Depth and Simultaneous Attack Battle Lab include: Theater Missile Defense (TMD); the Advanced Research Projects Agency (ARPA) Warbreaker Exercise; counter-narcotics support to the United States Southern Command; compressed sensor-to-shooter timelines; and, design of a deep operations coordination cell.



Photograph courtesy of McDonnell Douglas

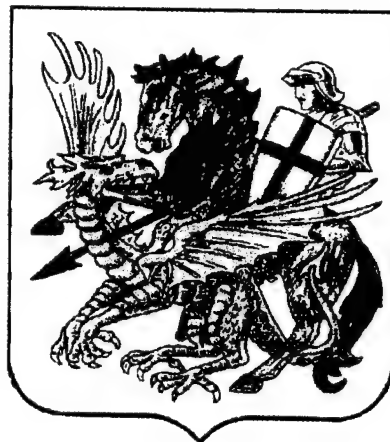
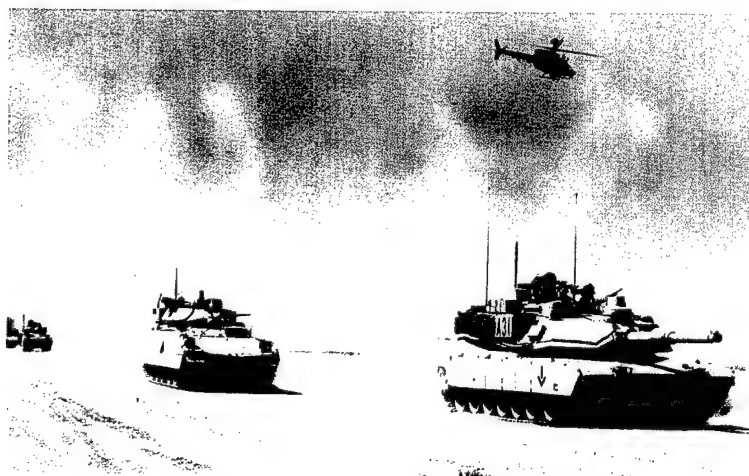


# Mounted Battle Space Battle Lab

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The concept of "mounted battle space" evolved at a relatively gradual, measured pace since the first time man fought from a moving platform. It was invariably linked to the range and speed of the platform, the distance a warrior could see and the range of his weapons. The aim has been to expand your own battle space and dominate it with the least numbers necessary. The beginnings of seeing the battlefield advantage of dominating an expanded battle space were clearly evident in Operation Desert Storm. Thus, these initial glimmerings became the basis for the experiments of this battle lab in late summer 1992.

The revolutionary advances of Information Age technologies have rapidly advanced the concept of expanding the mounted battle space. While the range and speed of platforms have not changed appreciably, the distance warriors can see and weapon ranges have. Moreover, the accuracy of weapons is such that the old adage, "if you can see it, you can hit it" is finally true. A variety of sensors provide real-time images of the entire battlefield. Global positioning systems pinpoint friendly locations. Digital information systems link forces. Precision guided long range weapons and "smart systems" firing "dumb" munitions can reach anywhere on the battlefield.



The Mounted Battle Space Battle Lab, located at Fort Knox, Kentucky, is responsible for preparing the Army to meet the new challenges of mounted battle space. Since the Army fights as combined arms and services teams, the lab horizontally and vertically integrates operational capabilities among all of the maneuver arms, to include aviation and supporting branches. The lab defines the requirements needed to dominate a battlefield—maintaining a lethal reach over an adversary, and massing the effects of friendly weapons systems while keeping forces dispersed and protected.

Key issues and initiatives being worked by the Mounted Battle Space Battle Lab include: how to fight a "digitized" combined arms and services team; force protection; unmanned aerial vehicles to support brigade-level task forces; vehicular nickel-cadmium batteries; vehicular auxiliary power units under armor; precision mortars; and Combat Unit XXI, an extensive Advanced Warfighting Experiment which examines organizational design and information flow options for Force XXI.

A major accomplishment of the Mounted Battle Space Battle Lab is to codify the requirements for "digitizing" the information systems for the combined arms and services team. This resulted in the formation of the Department of the Army Digitization Office in March of 1994, which will supervise and expedite the fielding of all digital equipment to the field.

# Dismounted Battle Space Battle Lab

Dominating an expanded battle space also applies where a preponderance of forces engaged are dismounted. Yet, consideration for improved operational capabilities for the individual dismounted soldier was almost lost in the Cold War paradigm of large mounted maneuver forces battling each other over vast distances. Moreover, recent operations and operations other than war by predominantly dismounted units confirm the advantage gained by dominating this battle space. The same revolutionary changes that affect the mounted battle space have profound impact on how individuals and groups of dismounted soldiers operate. Information Age technologies also increase the distance dismounted soldiers can see and the range and accuracy of their weapons systems. New technologies also provide unprecedented access to information.

The Dismounted Battle Space Battle Lab, located at Fort Benning, Georgia, is responsible for integrating all TRADOC activities that deal with soldiers operating in the dismounted battle space. As with the Mounted Battle Space Battle Lab, it seeks to define requirements needed to expand and dominate the battle space—maintaining a lethal reach over an adversary and massing weapons systems effects while dispersing forces...individual soldiers...throughout the battlefield. Thus, the beginnings of experiments of this battle lab in the fall of 1992 led to the establishment of the 2nd Generation Forward Looking Infrared (FLIR) Task Force.

Some of the dismounted battle space operational capabilities being explored are ways to conduct continuous operations, and improved ways to counter the effects of weapons of mass destruction, both of which are also 1994 Louisiana Maneuvers issues. Additionally, the lab is building on the success of its 2nd Generation FLIR Task Force, which began its work in 1992 and pioneered the means to take successful battle lab experimental results and integrate them horizontally across the combined arms team. Other key areas being worked by the lab are: Force XXI; dismounted soldier modeling and simulations; countermine for light forces; combat identification for light forces; dismounted soldier digitization; Rapid Force Projection Initiative or the Enhanced Fiber Optic Guided Missile Advanced Concept and Technology Demonstration; 21st Century Land Warrior; FY95 JRTC—Light Forces Digitization follow up to the Desert Hammer VI experiment; composite vehicle technologies; Bradley Fighting Vehicle platoon organizations; counter-narcotics technologies; non-lethal technologies; Operations other than War (OOTW); anti-armor capabilities; platoon mission planning rehearsal system; and counter sniper operations.





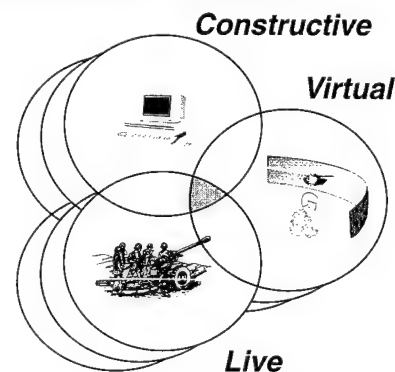
# Advanced Warfighting Experiments... -

**TRADOC Pam 525-5**  
**Generates**

**WARFIGHTING  
CONCEPTS**

- ▶ **Lessons Learned**
- ▶ **Vulnerabilities**
- ▶ **Anticipated Needs**
- ▶ **Emerging Technology**

**Evaluated in *Advanced Warfighting Experiments***  
**Battlefield Experimentation**



**Everything short of combat is simulation**

## ***...the Basis for all Battle Lab Experimentation***

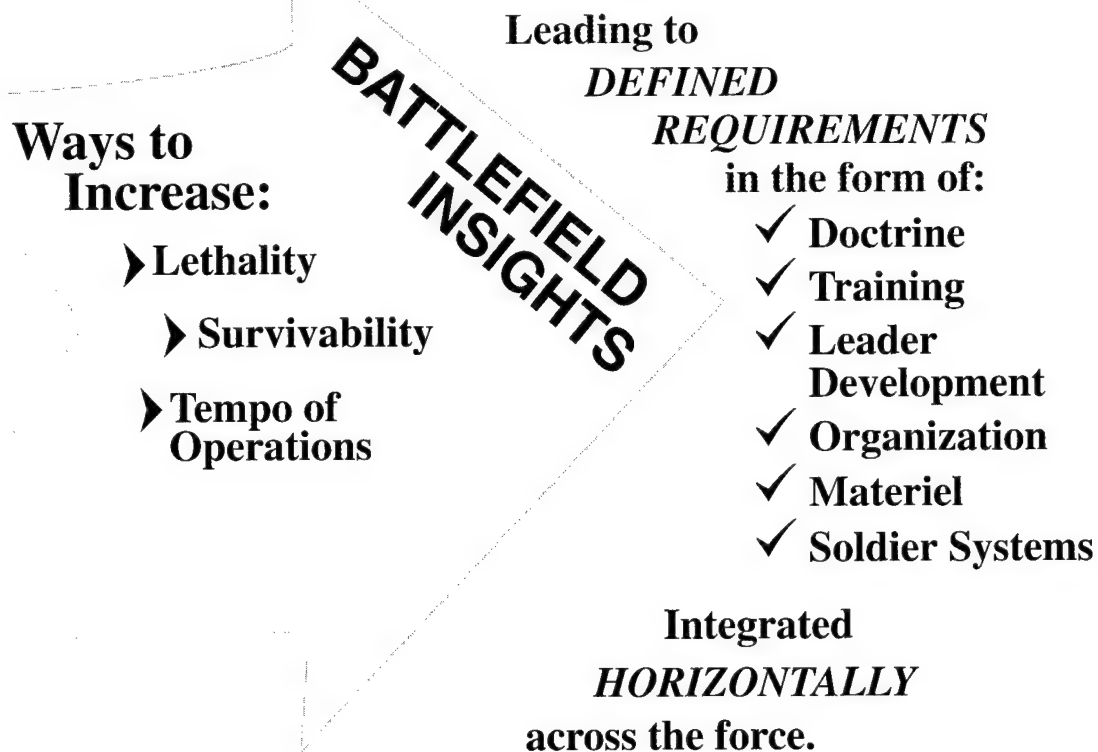
The historical approach for defining warfighting requirements was largely paper-based and “stovepiped” by branch. This worked reasonably well during the Cold War period, when the threat was clearly defined, easy to measure, and operated at a predictable pace. The Army integrated stovepiped systems individually because the pace was fairly slow.

Today, as mentioned above, the strategic, resource, policy, threat, and technology circumstances require new methods—experimental methods—using a team approach. The Army, in concert with the other Services, must field horizontally and vertically integrated capabilities to deployed forces. The best way to do this is to generate well-defined and **refined requirements** that can be translated quickly into doctrine, training, leader development, organizations, materiel, and soldier systems.

Experiments begin with hypotheses to improve battle results through increases in lethality, survivability, and tempo of operations in war and operations other than war as appropriate. Means to gain that end are selected, e.g., technology, training, organizational change or doctrine. Then experiments are done with a combination of constructive and virtual simulations. When a hypothesis needs further confirmation, battle labs conduct **Advanced Warfighting Experiments** against an opposing force so as to make it as tactically rigorous as possible.

TRADOC Pam 525-5, Future Full-Dimensional Operations, helps Battle Labs generate and use hypotheses called **warfighting concepts**. The warfighting concepts address the lessons learned from recent operations and identified vulnerabilities. Moreover, they address anticipated needs and the potential of emerging technologies. Battle Labs develop warfighting concepts so that experiments reveal improvement or degradation of unit performance.

**Battle Labs...**



Battle Labs experiment with warfighting concepts in a mix of progressive and iterative simulations using relevant scenarios conducted with field soldiers and units in tactically competitive environments. Soldiers and leaders are vital to success as they bring tactical savvy and wisdom gained from the variety of operations of our Army since the end of the Cold War. Battle Labs generate diverse operational employment data bases for each simulation by using a wide variety of relevant scenarios. Field soldiers and units provide “real-time” feedback on proposed concepts, replicate real soldier and unit behavior, and add their own “good ideas” to the process. Tactically competitive environments—with thinking opposing forces who are actively trying to win—make the experiments valid. Ultimately, the experiments generate *battlefield insights* as to the utility of the warfighting concepts.

Battlefield insights resulting from Battle Lab experiments reveal whether the warfighting concept improves lethality, survivability or

tempo of operations and thereby provides recommendations through the Army Chief of Staff and LAM Board of Directors for Army investment. Battle Labs translate concepts with significant *battlefield return on investment* into defined requirements for new doctrine, training, leader development, organizations, materiel, and soldier systems integrated horizontally across the entire force. Other insights inform future experiments.

*Those experimenting today will lead modernized units tomorrow.*

Togo D. West, Jr.  
Secretary of the Army

# A Mix of Progressive and Iterative Simulations Using Relevant Scenarios

Simulation technology is advancing rapidly and is increasingly being applied to a wide range of complex and diverse problems — this is especially true in the Battle Labs. Battle Labs are structured to assess the warfighting impact of advanced concepts and technologies, primarily using a comprehensive array of large-scale, high-fidelity simulations.

## Types of Simulations

Simulations can be broadly categorized as *constructive*, *virtual*, and *live*. **Constructive simulation** consists of wargames and models, many of which rely heavily on algorithmic and mathematical methods. These simulations were used extensively in the past and are the mainstay of the combat developments process. Examples include: Janus(A), VIC, and CASTFOREM.

**Virtual simulation** focuses largely on manned simulators interacting within a synthetic environment, in many cases with other simulators. The best known example are the SIMNET simulators in common use throughout the Army for both training and developmental work. Virtual simulations provide low-cost methods of experimenting with new technologies and prototypes. Battle Labs will rely heavily on this type of simulation, especially as the technology matures and proliferates. The best description of **live simulation** is actual soldiers and equipment operating together,



**Constructive Simulation**



Photograph courtesy of Evans & Sutherland

**Virtual Simulation**

possibly on instrumented ranges. The Army's Combat Training Centers are highly-instrumented, live simulation facilities developed for training, but with great potential for addressing Battle Lab issues by experimentation with actual soldiers and equipment.

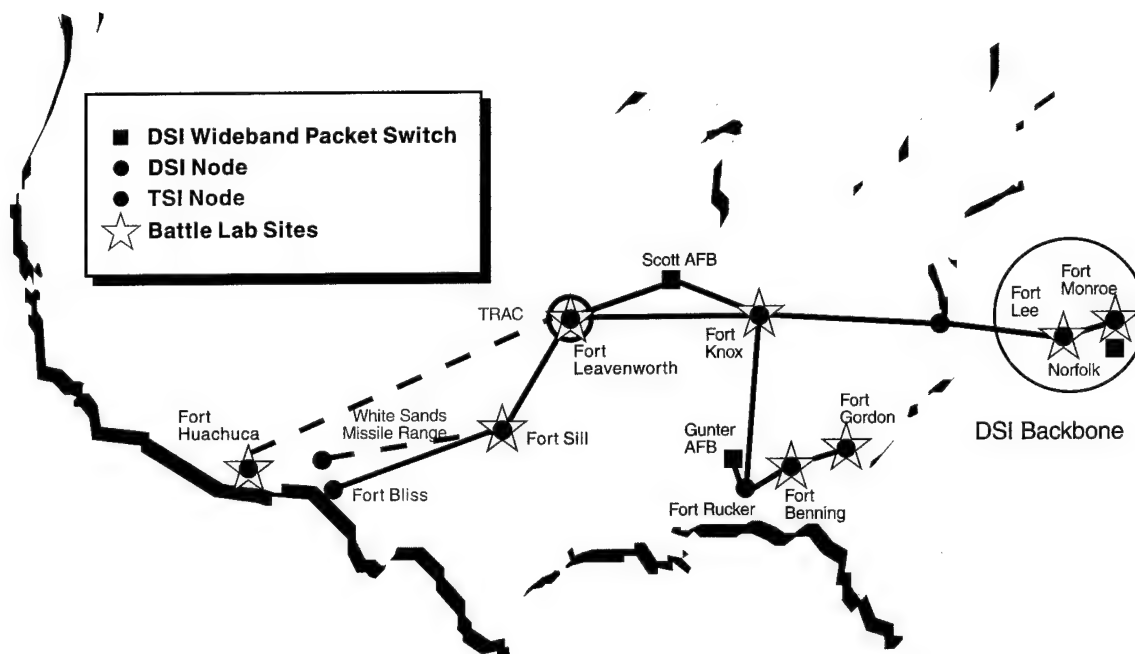


**Live Simulation**

## Distributed Interactive Simulation

Of course, there are pros and cons to the various types of simulations, and experimental designs must be tailored to take advantage of the strengths of individual simulations. Ultimately, these simulations will be tied together seamlessly — a primary objective of the Army's Distributed Interactive Simulation (DIS) program. Due to their geographic dispersion, Battle Labs are taking advantage of recent advances in wide-area communications. Circuits connect simulations and simulators together to create a highly

## TRADOC Simulation Internet (TSI)

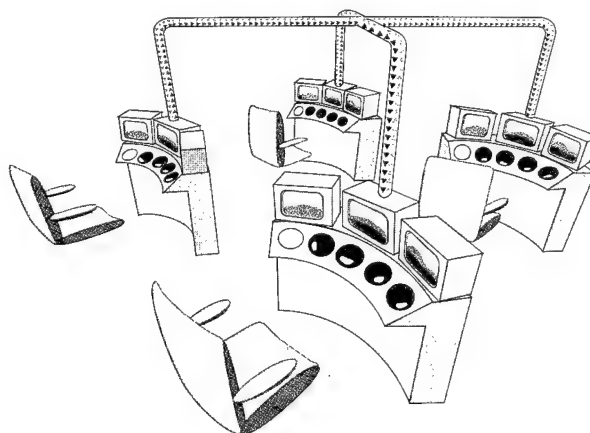


complex and realistic synthetic battlefield environment. TRADOC established the **TRADOC Simulation Internet (TSI)** to facilitate this. The TSI is a combination of Defense Simulation Internet (DSI) nodes, remote nodes and subnet circuits, that allow for independent operation among Battle Labs. The TSI is a prototype network that creates an independent, community-of-interest, DSI subnet, that will be fully operational by the end of the third quarter FY94.

### The Roles of Simulators

In addition to examining new platforms for future land warfare, Battle Labs also look at horizontal technology integration (HTI) and technology insertions (TI). To accomplish this work, the Army will rely more heavily on simulations to experiment with the warfighting impact of advanced concepts and technologies. In this regard, reconfigurable simulators are crucial for conducting Battle Lab experiments. The current generation of simulators simply do not possess the requisite analytical functionality required for Battle Lab experimentation and must often be modified at great expense. TRADOC is leading the effort to develop a new generation of simulators — **reconfigurable simulators** — through the Battle Lab Reconfigurable Simulator

Initiative (BLRSI). This initiative will develop a modular, reconfigurable software and hardware architecture to which future simulators can be designed and built. After development and testing of initial prototypes, TRADOC will field a modest suite of reconfigurable simulators to the Battle Labs. These reconfigurable simulators will link to larger simulations capabilities such as SIMNET, and allow the Battle Labs to interactively experiment on combined arms virtual battlefields.



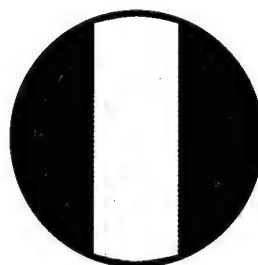
**Diagram of Reconfigurable Distributive Interactive Simulators**

# Conducted with Field Soldiers and Units... in Tactically Competitive Environments

A key ingredient of the Battle Labs formula for success is the extensive participation of soldiers and units during all phases of Advanced Warfighting Experiments. History is replete with examples of field soldiers and units developing innovative solutions to complex warfighting problems. Battle Labs actively seek the good ideas of field soldiers and their feedback on new concepts.

The Training and Doctrine Command has always been responsible for representing the "user" when writing doctrine, designing training programs, proposing organizational structure, preparing soldiers and leaders for field assignments, and defining requirements for new materiel. Through Battle Labs, the "user" participates in the experiments and provides "real time" insights and feedback. Battle Labs listen to soldiers and leaders.

All of the major U.S. Army field commands—Forces Command, U.S. Army Europe, U.S. Eighth Army (Korea), U.S. Army Pacific, U.S. Third Army (Central Command), U.S. Space and Strategic Defense Command, and U.S. Army South—are involved with Battle Labs experiments. Each Battle Lab experiment that involves field soldiers and units is reviewed and approved by the involved chains of command well in advance. Care is taken to avoid any negative impact on unit training, readiness or aspects of their "real world" mission.



## **Battle Labs**

*Battle Command*

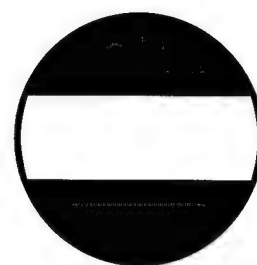
*Depth and  
Simultaneous  
Attack*

*Mounted Battle  
Space*

*Dismounted Battle  
Space*

*Combat Service  
Support*

*Early Entry, Lethality  
& Survivability*



## **Unit Affiliation**

*1st Inf Div  
1st Cav Div  
HQ, III Corps*

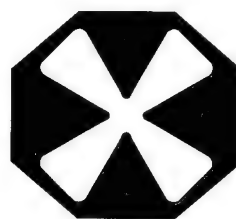
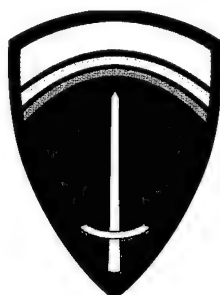
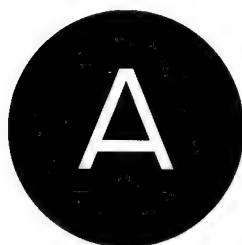
*101st AASLT Div  
11th ADA Bde  
HQ, III Corps Arty*

*2nd Ar Div  
194th Ar Bde*

*10th Mtn Div  
24th Inf Div  
82nd Abn Div  
101st AASLT Div  
HQ, XVIII Abn Corps*

*1st Inf Div  
1st COSCOM  
13th COSCOM*

*24th Inf Div  
82nd Abn Div  
10th Mtn Div  
1st Cav Div  
HQ, XVIII Abn Corps*

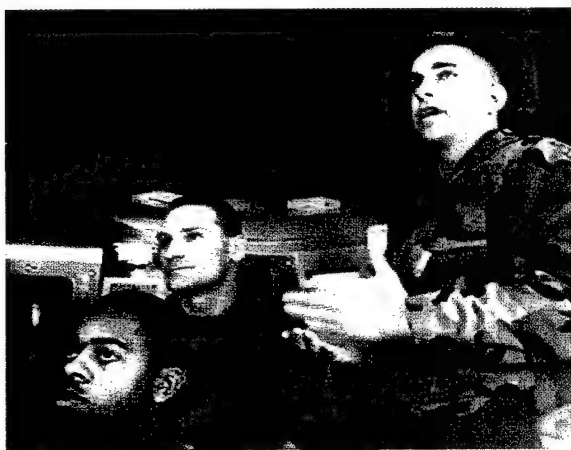




Photograph by Greg Stewart

Because of their proximity to the Battle Labs, the majority of field soldiers and units involved with Battle Lab experiments are from Forces Command. A Memorandum of Agreement between the Headquarters, Forces Command and Headquarters, Training and Doctrine Command aligns the Battle Labs with FORSCOM units. It allows direct coordination between the general officers commanding the organizations to plan and conduct local experiments. More detailed coordination with Headquarters, Forces Command is initiated when experiments are planned that will use a Combat Training Center—the National Training Center or the Joint Readiness Training Center.

There are numerous examples of field soldier and unit participation in Battle Labs experiments to date. The XVIII Airborne Corps and 82nd Airborne Division have been active participants in the Early Entry Lethality and



*We'll be able to test the equipment ourselves... [and] have much more confidence in it later on...*

**Sergeant First Class Meddad  
24th Infantry Division**



Survivability Battle Lab's "Early Entry Battle Command" and "Advanced Precision Airborne Delivery System" experiments. The Mounted Battle Space Battle Lab's "Force XXI Battle Command" experiments to "digitize" the force involved the 1st Cavalry Division, the 24th Infantry Division, and the 194th Separate Armored Brigade. Soldiers and units from the 24th Infantry Division and 101st Air Assault Division have been key to the success of the Dismounted Battle Space Battle Lab's "Own the Night" and 2nd Generation Forward Looking Infrared (FLIR) optic experiments. The III Corps Artillery and 11th Air Defense Artillery Brigade actively participate in a wide variety of Depth and Simultaneous Attack Battle Lab experiments. The Battle Command Battle Lab has worked with V Corps, 3rd Infantry Division, 1st Cavalry Division, and 1st Infantry Division units as it develops the "Army Battle Command System." Units from the 25th Infantry Division, 1st Corps Support Command, and 7th Transportation Group have contributed measurably to the many successes of the Combat Service Support Battle Lab's "Total Distribution System," "Split-Based Operations," and "Total Asset Visibility" experiments.

# From Theory to Reality... Advanced Warfighting Experiments

## Force XXI Battle Command

The genesis of horizontally digitizing the battlefield and the Advanced Warfighting Experiment program in general were discussions early in 1992 concerning ongoing efforts with the M1A2 program to field a digitized inter-vehicular information system (IVIS). Two issues were identified: a need for horizontal integration of this capability across the combined arms team, and a need to get soldier acceptance that such a capability improved their performance in tactically competitive environments at the National Training Center (NTC). The first Battle Labs experiment at the NTC was with a platoon of M1A2 tanks from the 1st Cavalry Division in September 1992. Since that first success, the technology has been to the NTC two more times, and extensively modeled in simulation at the Mounted Battle Space Battle Lab across the combined arms team. More importantly, what had started as a "stovepiped" capability for tanks, Battle Labs have developed into a horizontally integrated capability for the entire combined arms team to expand and dominate the battle space.

As with most success stories, timing was a key factor in defining requirements to digitize the force, or what is now called Force XXI Battle Command. The Army had other digital systems long before IVIS, to include TACFIRE and aviation systems, but there was little demand to implement a holistic approach. The Louisiana Maneuvers and Battle Labs provided the impetus to develop an Army-wide capability. The CG TRADOC designated the Mounted Battle Space Battle Lab lead agency and it began a series of progressive and iterative experiments to define requirements for a digitized force.

That first experiment in September 1992 led to insights and combined arms models evaluated in constructive simulations at the Mounted Battle Space Battle Lab at Fort Knox, Kentucky, in December 1992. The Chief of Staff of the Army then assigned the 1993 LAM issue, "Battle Command," to TRADOC. In March 1993, in a local training area at Fort Knox, the Mounted Battle Space Battle Lab conducted the first ever digitized combined arms field trials. The field trials used prototype equipment and work-around

solutions to digitally link a large suite of weapons systems—M1A2s, Bradley Fighting Vehicles, OH-58D Kiowa scout helicopters, M109A6 Paladin Howitzers, and mortars. The experiment was a huge success and provided dramatic evidence of the potential battlefield return on investment in digital information systems to increase lethality, survivability and tempo.

The next experiment, in July 1993, involved a digitized company-team at the NTC. As with the earlier NTC rotation, insights generated against the "thinking" opposing forces (OPFOR) provided a wealth of information. This information was again translated into a refined combined arms team model evaluated in constructive and virtual simulations at Fort Knox during December 1993. The soldiers involved in these simulations in turn generated more insights which further



refined the concept. Prior to these simulations, in October 1993, the Chief of Staff of the Army approved a major AWE at the NTC during rotation 94-07. It involved a combined arms task force equipped with 125 digitized systems. This experiment during April 1994, called Desert Hammer VI, was the capstone event of Force XXI Battle Command activity to date and combined TRADOC, FORSCOM, AMC and the Department of the Army in a teamwork enterprise that demonstrated the Army has changed the way it changes. It provided a window on the future of warfighting.





### Automatic Identification Technology

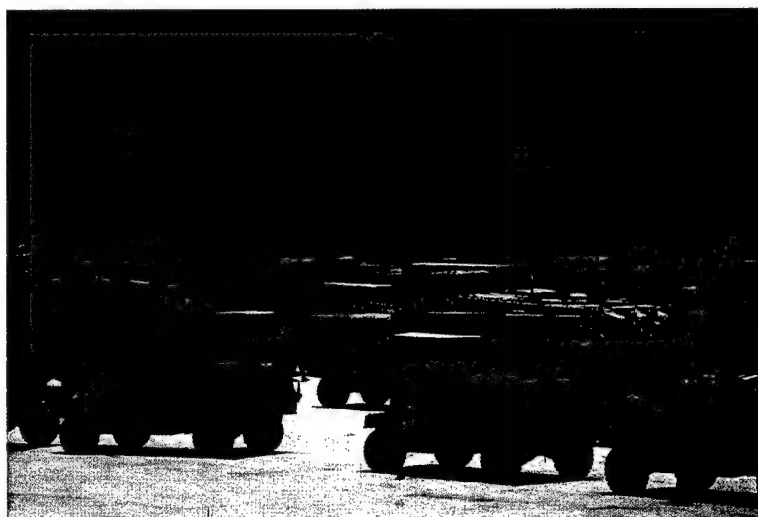
Of the 40,000 containers sent to the theater, over 25,000 had to be opened to determine the contents...the reality of this Gulf War statistic provided the impetus for experimentation with Automatic Identification Technology (AIT). The theory was that simple radio frequency (RF) devices, coupled with portable computing technology and satellite communications, could easily solve the "inside the box" visibility problem. The CSS Battle Lab, working in concert with the Department of the Army Deputy Chief of Staff for Logistics, the U.S. Army Transportation School, the Defense Logistics Agency, Department of Transportation, and many others, made this theory a reality in a matter of months.

During the post Desert Storm retrograde of supplies and equipment, the Army used global positioning devices linked to satellite transceivers and notebook computers to track and communicate with container ships. Success with these early devices led to further experimentation by the U.S. Army Transportation School in 1992. The Combat Service Support Battle Lab and Army Transportation School are currently working two initiatives related to Total Asset Visibility—the AIT initiative and the Movements Tracking System (MTS).

AIT uses omni-directional radio frequency tags placed on vehicles, containers, and ALOC pallets. The tags can carry standard MILSTAMP/MILSTRIP data and provide content information and report location when in range of "interrogators."

Interrogators operate with a variety of devices, such as satellite communication units (SCU), modems or cellular telephones, to report materiel location to a central or local database. Soldiers with hand-held interrogators can "see" inside the containers and make distribution decisions without opening the containers or even having to touch them. In the last 15 months, over 900 containers, pallets and military vehicles have been tagged in operations ranging from ammunition retrograde from Europe, JLOTS at Camp Lejeune, PREPO Afloat and the Somalia sustainment and retrograde efforts. The tags are reusable and many of them have made two trips from Europe by ship and a round trip to Somalia. Interrogator networks operated in climatic extremes from the harsh winters of Northern Germany and Pennsylvania to the hot deserts of Nevada and Somalia.

MTS uses some of the same equipment as AIT to provide visibility of moving items such as convoys, vessels and trains. SCUs, coupled with global positioning system equipment, allow soldiers to report their location and graphically show their movement on the computer screens of other units in their network. This allows commanders to view, on computer maps, the movement of units and prepare reception activities or provide guidance to the unit on the move. MTS operated successfully during the 1993 25th Infantry Division JRTC rotation (Task Force Bronco) and is in use with the Operation Able Sentry United Nations peacekeeping mission in Macedonia.



# From Theory to Reality...

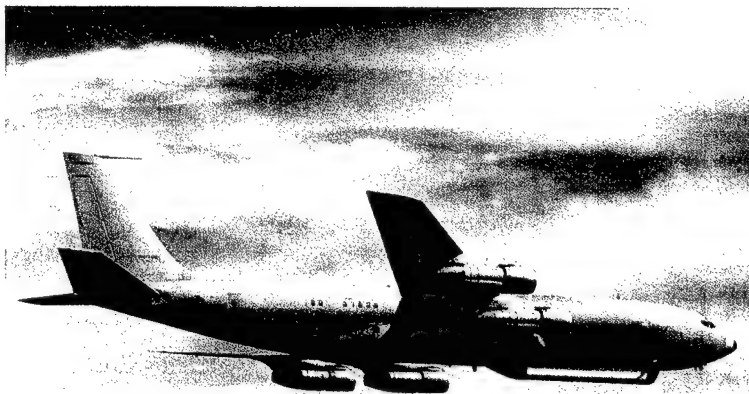
## Advanced Warfighting Experiments

### Sensor to Shooter Timelines

The battlefield dynamic of simultaneous attack throughout the depth of the battlefield hinges on detection of enemy locations, near-real time reporting of this information, and near-real time engagement by friendly weapons. Experience during Operation Desert Storm confirmed the battlefield advantage seen during Operation Just Cause, of simultaneous attack throughout the depth and breadth of the battle space. The Army's challenge was to reduce what is known as the sensor-to-shooter timeline or the time from target detection to target attack.

The Depth and Simultaneous Attack Battle Lab has led the Army's effort to streamline this sensor-to-shooter linkage. It has conducted a series of unilateral Army experiments and participated in several Joint experiments to define the requirements that will satisfy this need.

Early experiments involved modeling case studies from Operation Desert Storm. The base case was Jayhawk Thunder, which involved efforts to destroy a mobile Iraqi surface-to-air missile launcher. Comprehensive data documented the detection of the launcher by Joint Surveillance and Targeting Attack Radar System (JSTARS) and the eventual engagement by an Army Advanced Tactical Missile System



(ATACMS) battery. Evaluated in constructive simulations, the models generated insights. The insights revealed numerous procedural and command and control issues.

Changes generated by these insights were again modeled and evaluated in constructive simulation. Then, the battle lab conducted field trials at Nellis Air Force Base and White Sands Missile Range involving JSTARS and other sensors, command elements, and ATACMS units. The results of the experiments were significant reductions of the sensor-to-shooter timeline. Insights from these field trials resulted in more refinements, modeled and evaluated in a wider variety of constructive simulations using different, relevant scenarios, to include the Advanced Research Projects Agency (ARPA) WARBREAKER exercise.

A spin-off side benefit of the experiments is ongoing support to the United States Southern Command and Drug Enforcement Agency drug interdiction efforts. Drug interdiction also relies heavily on early detection, near-real time reporting of this information and near-real time action on the information. Therefore, the insights generated by the Depth and Simultaneous Attack Battle Lab will enhance Army operational capabilities in the future and are contributing measurably to the overall drug interdiction program today.

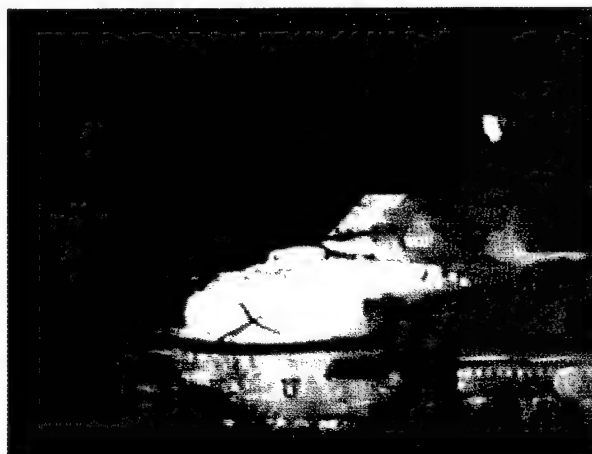
## Second Generation FLIR

The "Own the Night" experiments conducted by the Dismounted Battle Space Battle Lab have blazed a new trail for the Army to follow with regards to horizontally integrating requirements across the force and to expand and dominate the battle space. Early experiments at Fort Benning, Georgia, by the Dismounted Battle Space Battle Lab with the 24th Infantry Division confirmed the hypothesis that improved Forward Looking Infrared (FLIR) would increase the battle space and add to lethality, survivability, and tempo. Following these early Battle Labs successes and acting as the lead agency for the 1993 Louisiana Maneuvers issue, the battle lab supervised a Department of the Army Special Task Force endorsed by the Army Chief of Staff to define the requirements for the entire family of second generation forward looking infrared (FLIR) optics. The results were extraordinary.

The task force included members from most Army branches and other Services. They looked at current capabilities, anticipated needs, and available technologies. They conducted a variety of computer assisted analyses to optimize capabilities across the force. The STF conducted modeling to determine battlefield return on investment of various mixes of equipment and technologies. The task force ultimately produced an integrated requirements document for everything from individual soldier through attack helicopter optics. Because cost was a factor, heavy emphasis was placed on interchangeable parts, which resulted in requirements for "A" and "B" kits that can be used in a variety of platforms.



Generating the requirements document did not conclude the special task force mission. The TRADOC Analysis Command and Army Materiel Systems Analysis Activity modeled different types of mounted scenarios with 2nd Generation FLIR and evaluated them in a parametric sensitivity analysis and Cost and Operational Effectiveness Analysis. Insights from the simulations generated critical input to user requirements and technical specifications. A surrogate 2nd Generation FLIR was used during the digitized rotation at the National Training Center in April 1994 to help determine new tactics, techniques and procedures. All of these efforts make the Army better prepared to use the new technologies when ultimately fielded.



The operational requirements document for 2nd Generation FLIR is the lead document of many generated by the STF intended to streamline the acquisition process. As such, it is specially funded and tracked for rapid fielding. This is critical to the overall program success because this was the first time such a thoroughly integrated requirement had been generated, and the acquisition system was not designed to accept it. Because many of the optics are components of major end items such as tanks and helicopters, new ways to field them had to be developed. Other problems included using one requirements document for multiple capabilities and sharing test data instead of generating independent data. Ultimately, the "Own the Night" experiments will not only produce a more capable field army, they will help to reform the entire acquisition system.

# Battle Labs - Army Materiel Command...

## Partners in Change

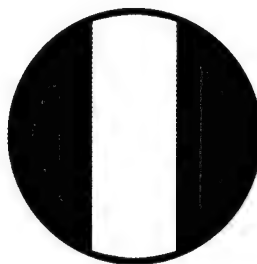
Battle Labs are teams. By design, Battle Labs bring together the combat developer, materiel developer, testers, and industry to experiment with new ideas, determine "what could be," and help focus research and development (R&D) resources.

The United States Army Materiel Command (AMC) plays a large role in this teaming effort. AMC assigned lead organizations for each of the Battle Labs, primarily Research, Development and Engineering Centers (RDEC), termed **Lead RDECs**.

Lead RDECs assigned nine **permanently stationed AMC personnel** to the Battle Labs. These personnel are not merely representatives, they are full fledged team members in the day-to-day business of planning, coordinating, and executing Advanced Warfighting Experiments. Lead RDECs provide access to the full breadth of resources within the Army Materiel Command. Information on relevant science and technology efforts is provided from across the AMC RDECs, Army Research Laboratory (ARL), and the Army Research Office (ARO). Lead RDECs also provide vital information on leading edge technologies from Industry and Academia. Just as important, the RDECs provide procurement, legal, financial, and disclosure expertise and services to the Battle Labs. The presence and strong support of AMC is enabling fully integrated effort from concept through production.

**Research and Development Information Management System (RIMS)**, developed for the Missile Command link Battle Labs and RDECs. RIMS provides access to a data base describing R&D efforts within the Army. RIMS also provides valuable electronic netting of Battle Labs and AMC activities for the exchange of information, including graphics.

Battle Labs, AMC, and other Army materiel developers forged a strong partnership in the **Army Science and Technology Objectives (STO)** process. The Deputy Assistant Secretary of the Army for Research and Technology (DASARD RT), permitted the field to determine the top 200 science and technology (S&T) endeavors. Battle Labs provide written statements of de-



### **Battle Labs**

*Battle Command*

*Depth and Simultaneous Attack*

*Mounted Battle Space*

*Dismounted Battle Space*

*Combat Service Support*

*Early Entry Lethality & Survivability*



### **Lead AMC Agencies**

*Communications-Electronics RDEC*

*Armament RDEC*

*Tank-Automotive RDEC*

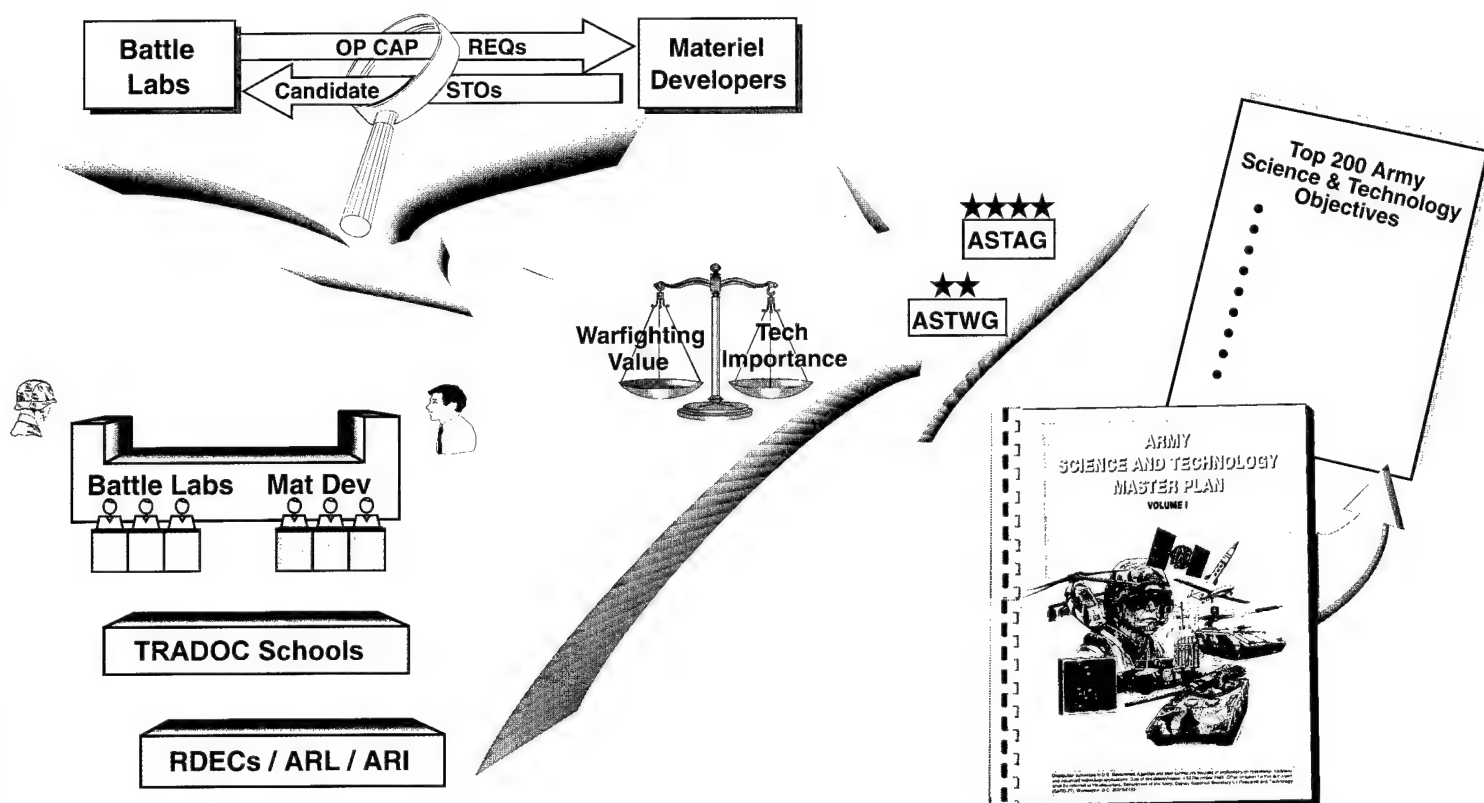
*Natick RDEC*

*HQ AMC  
ATTN: AMCLG-SG*

*Missile RDEC*

sired capabilities called **Operational Capability Requirements (OCR)**. OCRs are one basis from which candidate STOs are nominated. OCRs are the yardstick for measuring the warfighting contribution in the STO selection process. TRADOC, AMC, the Army Corps of Engineers, the Army Medical Research, Development, Acquisition, and Logistics Command, and the Army Research Institute participate in an annual conference to select the Army STOs. Army STOs receive senior Army leadership, oversight and budgetary protection by the DASARD(RT).

Battle Labs, in cooperation with the materiel development community, conduct comprehensive **Battle Lab Science & Technology Reviews**. Designed to complement the STO process, Battle Lab S&T Reviews assess all relevant Army



S&T endeavors from a warfighting perspective. Beyond feedback on individual S&T efforts, the Battle Lab S&T Reviews assess the total Army S&T program in aggregate to determine perceptions of overinvestment or shortfalls relative to the OCRs.

**Advanced Technology Demonstrations (ATDs)** assess the maturity of new technologies to transition into existing platforms or new systems. Battle Labs sponsor ATDs and work closely with the materiel developer to assure the warfighting relevance, conditions, and success criteria for ATDs.

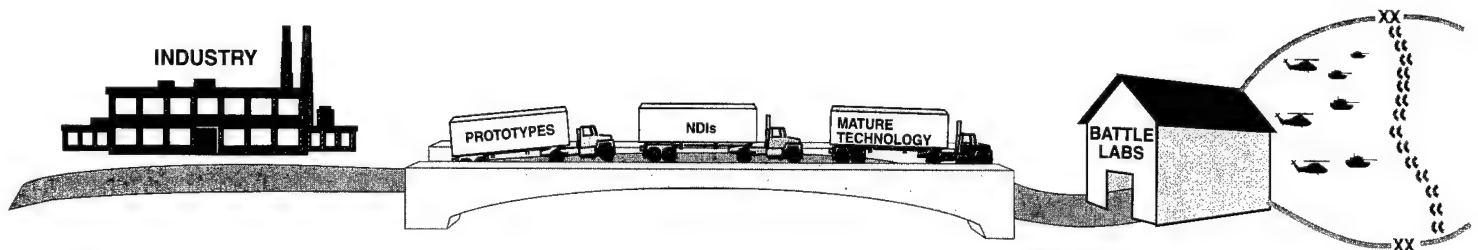
Battle Labs participate in the development of the **Army Science and Technology Master Plan (ASTMP)**. Besides publishing the list of Army STOs, the ASTMP articulates the Army's R&D strategy, processes, and organizational architecture. ASTMP highlights the role of the Battle Labs and provides a crosswalk between individual S&T projects and the battlefield dynamics. The ASTMP is used to reflect the warfighting

relevance of Army S&T to Congress and is a highly useful source of information for DoD contractors.

The **Advanced Concepts and Technology II (ACT II)** program provides linkage and access for industry to the Battle Lab process. The Army Research Office and the lead RDECs are the executive agents for soliciting proposals and join with the Battle Labs and the Louisiana Maneuvers Task Force in the source selection and contracting processes. This program is explained in the following section.

Improvements and reform of the acquisition process is a topic of vital interest to both Battle Labs and the Army Materiel Command. Teaming of effort is ongoing with SARD, HQDA, DISC4, OPTEC, AMC, and TRADOC to create agility within acquisition. Efforts include the involvement of industry to identify problems and offer recommendations to be incorporated in the Army acquisition reform strategy.

# Battle Labs - Focal Points for Civilian Technology Transfer



## Advanced Concepts and Technology Program II

Industry research and development efforts are vital sources of information for combat developers trying to better define requirements. Access to this information helps focus requirements documents and keep them in the realm of the possible. Battle Labs place a high premium on interaction with Industry in the battle lab process. Continuous dialogue and the exchange of ideas opens many doors of opportunity... opportunity for Battle Labs to discover, experiment, and harness the potential of future technologies... opportunity for Industry to better understand and satisfy the needs of the Army as a potential customer. Several avenues provide access for Battle Lab - Industry interaction.

Congress, in recognition of the merits of Battle Labs, has specified funding to cement the Battle Lab - Industry link. The Advanced Concepts and Technology II (ACT II) program was funded with \$10M in FY 94, and is expected to be funded at the \$40M - \$50M level in subsequent years. ACT II funds permit Battle Labs to solicit for mature technologies, industry generated prototypes, and Non-Developmental Items (NDI) for demonstration within Battle Lab experiments.

Battle Labs articulate areas of warfighting focus and technology topics via ACT II **Broad Agency Announcements (BAA)**. Announcements of ACT II BAA's are made in the Commerce Business Daily. The Army Research Office (ARO) is the Army's executive agent for publication and dissemination of ACT II BAA's. Written communication concerning ACT II BAAs can be addressed to:

Department of the Army  
U.S. Army Research Office  
ATTN: AMXRO-PR (ACT II)  
P.O. Box 12211  
4300 South Miami Boulevard  
Research Triangle Park, NC  
27709-2211

ACT II source selection process combines Battle Lab assessments for warfighting value and Army scientists and engineer assessments for technical merits. Proposals producing demonstrations within one year's effort have the greatest potential for selection.

Industry is strongly encouraged to obtain ACT II BAAs and participate in this program.



## How To Do Business With Battle Labs

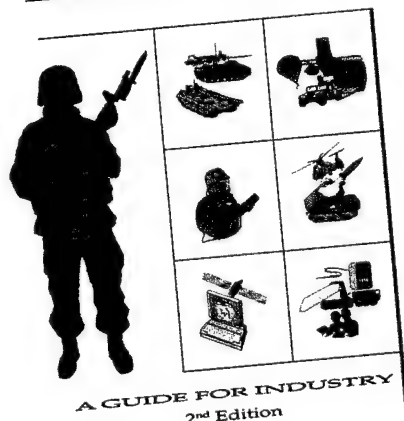
Jointly produced by the U.S. Army Training and Doctrine Command and the U.S. Army Materiel Command, "How to Do Business With Battle Labs" more fully describes opportunities for Battle Lab - Industry interaction. Topics include protection of proprietary information, sources of funding, and an extensive directory of points of contact for various programs. Small Business Innovative Research Program, Cooperative R&D Agreements, and Independent Research and Development are discussed. Additionally, the pamphlet offers several suggestions for Industry participation in the Battle Lab process. Copies of the pamphlet can be obtained from:

Commander, AMC  
ATTN: AMCRD-IT  
5001 Eisenhower Ave  
Alexandria, VA 2233-0001  
TEL: (703) 27409148

or

Commander, TRADOC  
ATTN: ATCD-B  
Fort Monore, VA 23651-5000  
TEL: (1-800) 552-3357

### How to Do Business With Battle Labs



## Discovering the Opportunities

Direct dialogue with the Battle Labs is the most effective method for discovering opportunities. Industry is encouraged to make contact by phone and/or writing to the appropriate Battle Lab points of contact.

Interaction will be significantly increased by a preliminary review and understanding of the battlefield dynamics and Battle Lab "Operational Capability Requirements." Battlefield dynamics are the focus areas for each Battle Lab. The battlefield dynamics are discussed in earlier sections of this brochure. Operational Capability Requirements (OCR) articulate the capabilities required for the Army to fulfill its vision of future warfighting. The latter can be found within the Army Science and Technology Master Plan.

The Army Science and Technology Master Plan (ASTMP) contains two highly detailed volumes which are available to U.S. Government Agencies and their contractors. The ASTMP articulates the Army's S&T strategy, the Army's most important Science and Technology Objectives (STO), as well as the Battle Labs' Operational Capabilities Requirements. The ASTMP can be obtained by writing to the following address:

Headquarters  
Department of the Army  
Deputy Assistant Secretary  
for Research and Technology  
(SARD-ZT)  
Washington, D.C. 20310-0103



# Joint, Allied and Inter-Agency Participation...



One of the more significant lessons of recent operations such as Desert Shield/Storm, Just Cause, Restore Hope, and Provide Comfort is that the journey to land force dominance can only be traveled by forces that are truly joint. Accordingly, Battle Labs work in close partnership with all of America's military departments. Fully half of all Advanced Warfighting Experiments are conducted with participation by one or more Services. Several AWEs, including Depth and Simultaneous Attack Battle Lab's Operational Concepts Demonstration II, and Battle Command Battle Lab's Joint Warrior Interoperability Demonstration (JWID), have full participation by all four Services. These efforts ensure that insights are shared by the Services, so that as we build the Army of the 21st Century, we are building an army that is consistent across all DTLOMS and Battlefield Operating Systems with our sister Services.

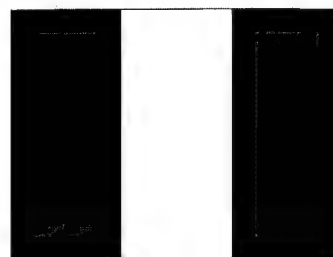
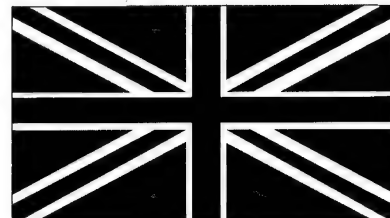
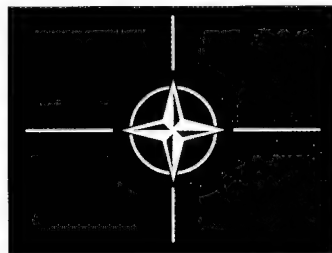
Battle Lab efforts of the Army and the Marine Corps, the nation's two land combat forces, are particularly close. The Commanding General, Marine Corps Combat Development Command (MCCDC) at Quantico, Virginia is a full partner in the Battle Lab process. During 1994 the USMC is participating in numerous AWEs, to include the "Own the Night" experiment in cooperation with the Dismounted Battle Space Battle Lab.

Air Force participation in the Battle Lab process is particularly critical across all the battlefield dynamics. Battle Labs work closely with the Air Combat Command (ACC) at Langley AFB, Virginia to ensure the air component is integrated in all experimentation. Operation Desert Capture II was a significant AWE conducted by the Battle Command Battle Lab, the Mounted Battle Space Battle Lab, and the ACC during NTC Rotation 94-07.

Partnership between Battle Labs and the Navy is being developed through the Naval Doctrine Command and the United States Atlantic Fleet, both located at Norfolk, Virginia. Early Entry Lethality and Survivability AWEs, including Prepositioned Brigade Afloat and Logistics Over the Shore, are being conducted in conjunction with the naval service.

Recent experience has again confirmed that modern warfighting is not only joint, but coalition in nature. Therefore, Battle Lab operations are being conducted in cooperation with members of existing coalitions, such as NATO, and potential Allies in future conflict. The United Kingdom has established Land Combat Directorates similar in purpose and methodology to Battle Labs and, during 1994, the emerging partnership between specific labs and UK Directorates will lead to cooperative experiments. Similarly, U.S. Battle Labs are participating with the Federal Republic of Germany and the Republic of France to insure future experimentation meets the needs of both countries while yielding forces that maintain the interoperability developed during over forty years of NATO partnership. Battle Lab input to numerous bilateral and coalition Staff Talks continues to be an important means to ensure that the U.S. Army of the 21st Century is a force capable of contributing significantly to any future partnership on the battlefield.

Hurricanes, floods, earthquakes, fires, and illegal drug trafficking have threatened the livelihood of Americans during the recent past. Army support during these crises has been inter-agency in nature. During 1994, Battle Labs coordinated with the Drug Enforcement Agency (DEA), linking experimentation with improved sensor-to-shooter linkages to combating illegal substance manufacture and trafficking. Battle Labs also initiated processes to coordinate with the Central Intelligence Agency (CIA) to identify areas where mutual cooperation will increase the capabilities of both organizations. Battle Lab experimentation such as Force Provider by the Combat Service Support Battle Lab have implications for the Federal Emergency Management Agency (FEMA) and have contributed directly to the development of capabilities that will ensure future inter-agency efforts during domestic crisis are effective and successful.



# Battle Labs and the Louisiana Maneuvers...

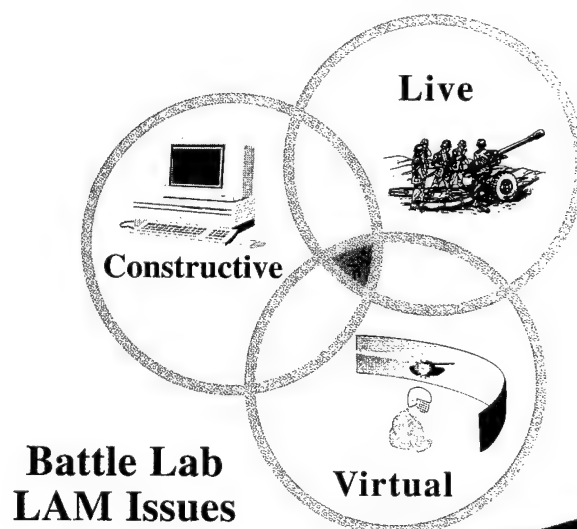
The Army of the 1990's and the 21st Century will continue to grow in capabilities due in large part to the synergistic effects of the Louisiana Maneuvers and Battle Labs programs. While each has many activities that are independent of the other, when they are working on the same issues, unparalleled levels of performance are achieved. As Army Chief of Staff General Sullivan has stated, the Army has changed the way it changes.

As described earlier, the Louisiana Maneuvers board of directors approves and prioritizes key warfighting and Title 10, United States Code issues that need to be addressed. Some of these warfighting issues are the result of early experimentation in Battle Labs as mentioned earlier. Those issues are assigned to Army major commands. When TRADOC is assigned issues, the Battle Labs are usually its lead agents.

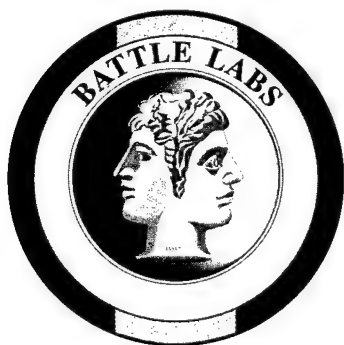
TRADOC was assigned seven Louisiana Maneuvers issues in fiscal year 1993. Five of them were subsequently assigned to Battle Labs for action. The issues were: "Own the Night," "Battle Command," "Equipping," "Commercial Space Package," and "Force Projection Army Intelligence." The Dismounted Battle Space Battle Lab was the lead agent for continuing its work in the "Own the Night" issue and explored ways for the Army to maintain and improve its overmatch advantage in night fighting into the 21st Century. The Mounted Battle Space Battle Lab was the lead agent to continue its work to expand the battle space by assuming the lead for the "Battle Command" issue which focused on the means to insert digital technology across the combined arms. The Battle Lab Integration and Technology Directorate at Headquarters, TRADOC was the lead

## '93 TRADOC LAM Issues

- *Equipping* - BLITD
- *Unfamiliar Forces* - DCSDOC
- *HQ Echelons Above Corps* - CAC
- *Battle Command* - MBSML
- *Own the Night* - DBSBL
- *Force Projection Army (C2)* - Intel - BCBL
- *Commercial Space Package* - (CSP) - BCBL



agent for the "Equipping" issue and assessed new technologies to improve lethality, deployability, and survivability of units and, at the same time explored ways to accelerate the materiel acquisition process. The Battle Command Battle Lab was the lead agent for the "Commercial Space Package" issue. The lab developed a plan to employ extant commercial space capabilities to provide improved command and control, intelligence, weather data, and mission planning capabilities. The Depth and Simultaneous Attack Battle Lab was the lead agent for the "Force Projection Army Intelligence" issue and evaluated the mix, effectiveness and vulnerabilities



### '94 TRADOC LAM Issues

- *Holistic Review of C4I - BCBL*
- *Continuous Operations - DBSBL*
- *New Technologies - BLITD*
- *More Lethal, Survivable, Deployable Forces - EELS*
- *Weapons of Mass Destruction - DBSBL*



**Advanced  
Warfighting  
Experiments**

of intelligence capabilities for joint, combined, allied and coalition operations.

TRADOC was assigned five Louisiana Maneuvers issues in fiscal year 1994. All of them were assigned to Battle Labs for action. The issues are "Command, Control, Communications, Computers and Intelligence (C4I)," "Continuous Operations," "New Technologies," "Deployable Forces," and "Weapons of Mass Destruction." The Battle Command Battle Lab is the lead agent for the "C4I" issue and is looking at ways to standardize and integrate C4I in the Army, make them interoperable in Joint operations, and provide commander's with timely integrated topographic products for force projection operations. The Dismounted Battle Space Battle Lab is the lead agent for the issue "Continuous Operations" which is a follow-on to its 1993 "Own the Night" issue and



looks for technologies and methods to improve our capability to conduct continuous operations for protracted periods. The Battle Lab Integration and Technology Directorate is responsible for the "New Technologies" issue which is a follow-on to its 1993 "Equipping" issue and involves determining the impact of new technologies on the battlefield, identifying low-cost, high-payoff soldier systems, and developing a coordinated suite of unmanned aerial and ground vehicles. The Early Entry Lethality and Survivability Battle Lab is the lead agent for the "Deployable Forces" issue and is looking at: ways to make light forces more lethal, survivable, tactically mobile and sustainable; potential contributions of "middle weight" forces to early entry operations; how to make heavy forces more deployable; and changes to Department of the Army structures to meet force projection needs. The Dismounted Battle Space Battle Lab is responsible for the "Weapons of Mass Destruction (WMD)" issue and is investigating the long term NBC threat, the impact of WMD and options following use on tactical and operational units, and the need, if any, to modify current NBC doctrine.

TRADOC was assigned two Louisiana Maneuvers issues for fiscal year 1995. One of them, "Enhanced Command, Control, Communications, Computers, and Intelligence (C4I)" has been assigned to a Battle Lab for action. It will be addressed by the Battle Command Battle Lab as a continuation to its 1994 "C4I" issue and will involve: developing a maneuver-terrain visualization system; synchronizing the intelligence and electronic warfare (IEW) effort; studying the effects of improved C4I on organization effectiveness and design; ensuring Army C4I systems are interoperable with joint systems; and developing enroute communication and information systems capabilities for deploying forces.

# Battle Labs Campaign Plan for the Future...

## The Way Ahead...

The Battle Lab Campaign Plan provides focus and purpose for the design, preparation, and execution of future experimentation. The accomplishments of the past two years in "changing the way we change," are the foundation for these experiments as we move toward **Force XXI**, the Army of the 21st Century. General Franks has described his intent for the campaign:

*Construct and conduct experiments using virtual, constructive and live simulations in all Battle Labs to increase lethality, survivability, and tempo in scenarios that represent the broad array of possible U.S. Forces commitment for the next 10-15 years. Use TRADOC Pam 525-5 as the conceptual underpinning for Force XXI concepts and design. Focus remainder of FY 94 and FY 95 on examination and experimentation with different alternative relationships to maximize the power of information connectivity between combat, combat support, and combat service support and resultant implications across DTLOMS.*

The start point for the coming campaign is both conceptual and experimental in nature. The conceptual basis remains TRADOC Pam 525-5, the TRADOC concept for information-based full-dimensional operations in the 21st Century. This is a living, evolving concept constantly being refined as we clarify the doctrinal needs of a force optimized to advantage information and emerging technologies while continuing to leverage the power of the American soldier.

Key Advanced Warfighting Experiments (AWE) conducted during this year are providing the insights necessary to chart the way ahead for experimentation. Operations in Somalia, Macedonia, readiness deployments, and training exercises around the world provide a baseline of current capabilities, while identifying needed capabilities for future forces. The Desert Hammer VI and Operation Desert Capture II AWEs are providing valuable insights as to the warfighting requirements of a fully digitized force. The Mobile Strike Force experiment, conducted with the Prairie Warrior GHQ-x94 Louisiana Maneuvers exercise, provides additional insights into the potential impact of future technologies on doctrine, tactics, and organization requirements. The aggregate insights from all early Battle Lab experiments constitute a baseline for future Battle Lab experimentation.

The campaign plan for the remainder of fiscal year 1994 and beyond employs "attacks" on two axes. The overall campaign objective consists of **refined requirements for Force XXI**, the 21st Century Army. Information process experimentation is the initial main effort, focused on examining battle command processes to determine which are best conducted hierarchically and which are more effective using internettted or other means in high performing tactical organizations. The supporting effort will be to examine the organizations and operations derived from our concept of full-dimensional operations that can best execute the processes developed through the experimentation. The organizational effort will focus on determining the optimum combination, at each echelon, of combat, combat support, and combat service support to fight and win decisively at least cost to our soldiers. The operations effort will focus on capturing emerging doctrine, tactics, techniques, and procedures; as well as leader development and training requirements for the force and feeding those insights back into our future warfighting concept. It is important to note that Battle Labs experimentation is not only with advanced technology, but also with training, leader development, organizations and doctrine experiments as well.

Each Battle Lab will have a focus of experimentation as follows:

**Dismounted Battle Space Battle Lab** will design and conduct a series of AWEs leading to a capstone AWE Desert Hammer VI style experiment with light/heavy/SOF configuration in late FY 95 to examine digital connectivity and improved Battle Command.

**Mounted Battle Space Battle Lab** will conduct the Combat Unit XXI AWE to maximize the power of information connectivity between CA, CS, CSS units in terms of increasing the units' lethality, survivability and tempo. The lab will use AWE Desert Hammer VI insights as the base case and design and conduct follow-on experiments at the NTC in FY 95. It will focus on the task force, and begin designing Force XXI.

**Battle Command Battle Lab** will design and execute a series of AWEs to examine how high performing tactical units execute Battle Command focusing on information processing to determine which processes should be hierarchical and which

## The Campaign

### Strategic Goals:

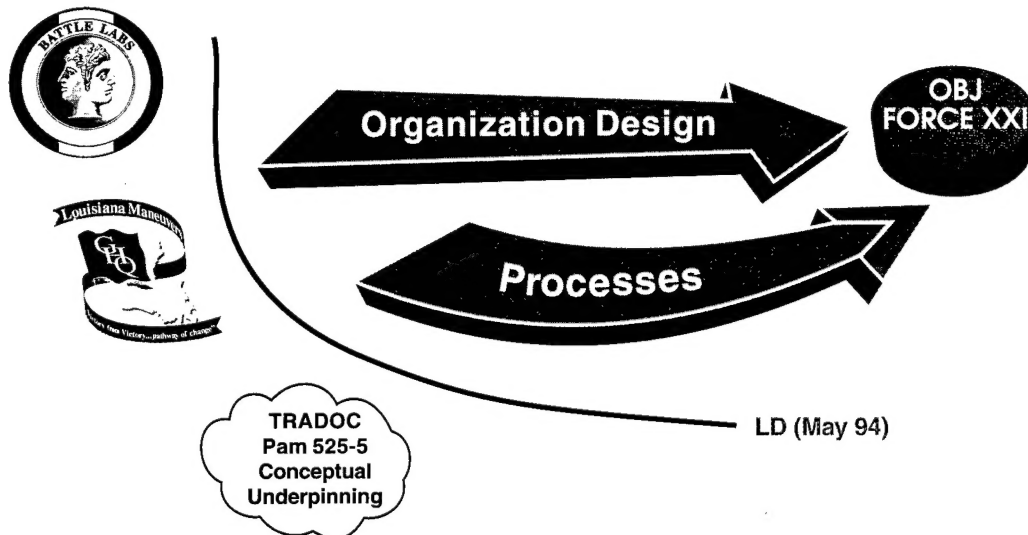
Design Force XXI — Inform Army of implications of digitized, full dimensional operations with 21st Century Technology.

### Operational Method:

Execute experimentation with main effort of organizational design, supporting effort of improving processes to leverage emerging capabilities across DTLOMS.

### Tactical Means:

Battle Lab experimentation, LAM issues, GHQx excursions, and support of current Army operations. Use all forms of simulations... constructive, virtual and field trials.



internetted with resultant changes between echelons and combat, combat support, and combat service support.

**Early Entry Lethality and Survivability**  
*Battle Lab* will design and execute a series of AWEs to examine ways to optimize forces for early entry using battlefield lethality, survivability, and tempo insights derived from Desert Hammer VI, Mobile Strike Force, and Combat Unit XXI experimentation. The experiments will initially focus at the division-level.

**Combat Service Support Battle Lab** will design and execute a series of AWEs that build upon Mobile Strike Force, GHQ-x94 LAM exercises, and Desert Hammer VI insights to identify

improvements required in CSS processes and organizations to maintain tempo of operations in 21st Century land combat.

**Depth and Simultaneous Attack Battle Lab** will design and conduct a series of AWEs with particular emphasis on Army and Joint capabilities to improve force protection and further refine sensor-to-shooter timelines.

A **Battle Labs Campaign Primer** provides information as to how each lab will execute its missions. The primer contains the schedule and a brief description of all 99 experiments currently planned for the remainder of FY 94 and FY 95.



# Battle Labs Points of Contact

## **Battle Command Ft Leavenworth**

DSN: 552-3323/4837  
CML: (913) 684-3323/4837  
1-800-769-2034  
FAX: (913) 684-2842  
Mailing Address:  
CDR, USACAC  
ATTN: ATZL-CDC  
Ft Leavenworth, KS 66027-5300

## **Battle Command Ft Gordon**

DSN: 780-2057/2557  
CML: (706) 791-2057/2557  
FAX: (706) 791-8346  
Mailing Address:  
CDR, USASC&FG  
ATTN: ATZH-BLT  
Ft Gordon, GA 30905-5294

## **Battle Command Ft Huachuca**

DSN: 821-4661/2247  
CML: (602) 533-4661/2247  
FAX: (602) 533-4701  
Mailing Address:  
CDR, USAIC&FH  
ATTN: ATZS-CDT  
Ft Huachuca, AZ 85613-6000

## **Combat Service Support**

DSN: 687-1681/2247  
CML: (804) 734-1681/2247  
1-800-258-9440  
FAX: (804) 734-2880  
Mailing Address:  
CDR, USACASCOM  
ATTN: ATCL-C  
Ft Lee, VA 23801-6000

## **Battle Lab Integration & Technology Directorate**

DSN: 680-5850 CML: (804) 728-5850 or 1-800-552-3357 FAX: (804) 727-2947  
Mailing Address: CDR, USATRADO, ATTN: ATCD-B, Ft Monroe, VA 23651-5000

## **Depth & Simultaneous Attack**

DSN: 639-5647/6954  
CML: (405) 442-5647  
1-800-688-4830  
FAX: (405) 442-5028  
Mailing Address:  
COMDT, USAFAS  
ATTN: ATSF-CBL  
Ft Sill, OK 73503-5600

## **Mounted Battle Space**

DSN: 464-8247/4989/1965  
CML: (502) 624-8247  
1-800-525-6848  
FAX: (502) 624-1932  
Mailing Address:  
CDR, USAARMC  
ATTN: ATZK-MW  
Ft Knox, KY 40121-5000

## **Dismounted Battle Space**

DSN: 835-2310/2489  
CML: (706) 545-2310  
FAX: (706) 545-3841  
Mailing Address:  
COMDT, USAIS  
ATTN: ATSH-IWC  
Ft Benning, GA 31905-5007

## **Early Entry Lethality and Survivability**

DSN: 680-2620  
CML: (804) 727-2620  
1-800-551-3357  
FAX: (804) 728-5861  
Mailing Address:  
CDR, USATRADO  
ATTN: ATCD-L  
Ft Monroe, VA 23651-5000

*More powerful than the tread  
of armies is an idea whose  
time has come.*

**Victor Hugo**